

**Environmental Assessment for Range Operations Expansion
at the
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337**



October 17, 1997

Final

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Lead Agency: NASA, Wallops Flight Facility

Cooperating Agency: DOT/FAA Office of the Associate Administrator for
Commercial Space Transportation

Proposed Action: Expansion of launch range operations at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (GSFC's WFF), to enable a broader range of research, technology development, academic activities, and for the development and operation of a licensed commercial Spaceport at WFF.

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NOTICE OF CHANGE

Incorporated in this Final Environmental Assessment for Range Operations Expansion are grammatical corrections and additional technical clarifications. The corrections do not reflect changes to either the intent or scope of the document. These clarifications were incorporated after closure of the public comment period and are presented in Appendix I.

Abstract

The National Aeronautics and Space Administration (NASA) proposes to enhance National launch capabilities through improvements to infrastructure to support the expansion of launch range capabilities at Goddard Space Flight Center's Wallops Flight Facility (GSFC's WFF). The major actions proposed include: (1) establishment of a commercial Spaceport at WFF; (2) improvements to infrastructure to support the expansion of launch operations; (3) expanding launch operations to accommodate twelve additional orbital launches per year; and (4) restoration of the historical level and nature of operations on the WFF range. The improvements and expansion will enable a broader range of research, technology development, and academic activities.

The following alternatives to the proposed action were considered: (1) Spaceport Florida which is located adjacent to Cape Canaveral Air Station on the east coast of Florida; (2) California Spaceport located at Vandenberg Air Force Base, California; (3) Kodiak Launch Complex in Kodiak, Alaska; (4) foreign Spaceports in nations such as Russia, Japan, China, Canada, and India; and (5) No Action.

This Environmental Assessment (EA) evaluates the environmental consequences of the proposed actions. These environmental concerns include, but are not necessarily limited to: air and water quality, noise, flora and fauna, threatened and endangered species, health and safety, solid and hazardous waste management, socioeconomics, land use, and wetlands and floodplain management.

Abbreviations & Acronyms

| | |
|-------|---|
| ACOE | Army Corps of Engineers |
| AST | Office of the Associate Administrator for Commercial Space Transportation |
| CCAS | Cape Canaveral Air Station |
| CCSI | Center for Commercial Space Infrastructure |
| CIT | Center for Innovative Technology |
| CSLA | Commercial Space Launch Act |
| DAPC | Department of Air Pollution Control |
| DEQ | Department of Environmental Quality |
| DOT | Department of Transportation |
| EA | Environmental Assessment |
| EJ | Environmental Justice |
| ELV | Expendable Launch Vehicle |
| EPA | Environmental Protection Agency |
| ERD | Environmental Resources Document |
| ERT | Emergency Response Team |
| FAA | Federal Aviation Administration |
| FMB | Facilities Management Branch |
| FONSI | Finding of No Significant Impact |
| FOTW | Federally Owned Treatment Works |
| GSFC | Goddard Space Flight Center |
| HTPB | hydroxyl terminated polybutadiene |
| LEO | low-earth orbit |
| LMLV | Lockheed-Martin Launch Vehicle |
| NAAQS | National Ambient Air Quality Standards |
| NACA | National Advisory Committee for Aeronautics |

| | |
|---------|---|
| NASA | National Aeronautics and Space Administration |
| NAWC/AD | Naval Air Warfare Center/Aircraft Division |
| NEPA | National Environmental Policy Act |
| NOAA | National Oceanic and Atmospheric Administration |
| NOI | Notice of Intent |
| OB/OD | Open Burn Open Detonation |
| ODU | Old Dominion University |
| OSD | Operations and Space Directive |
| OSHA | Occupational Safety and Health Association |
| OSPL | overall sound pressure level |
| PCB | polychlorinated biphenyl |
| SPCC | Spill Prevention, Control, and Countermeasures Plan |
| SPOD | Suborbital Projects and Operations Directorate |
| SRB | Solid Rocket Booster |
| STE | Space Technology Enterprise |
| TSCA | Toxic Substances Control Act |
| TSDF | Treatment, Storage and Disposal Facility |
| USFWS | United States Fish and Wildlife Service |
| VAFB | Vandenberg Air Force Base |
| VCSFA | Virginia Commercial Space Flight Authority |
| VIC | Visitor Information Center |
| VIMS | Virginia Institute of Marine Science |
| VMRC | Virginia Marine Resources Commission |
| VPDES | Virginia Pollutant Discharge Elimination System |
| VSC | Virginia Spaceflight Center |
| WFF | Goddard Space Flight Center's Wallops Flight Facility |
| WIMSC | Wallops Island Marine Science Consortium |

Glossary

| | |
|-------------------------|--|
| acute | sudden, severe in effect, intense, brief and severe |
| chronic | continuing a long time or recurring frequently, having a long duration, constant, frequently |
| class 100,000 cleanroom | a room in which the concentration of airborne particles is controlled to less than 0.5 mm in size |
| cumulative | increasing or growing by accumulation or successive additions |
| diffusion model | a method of calculating parameters of diffusion, such as concentrations of emitted substances, over geographical areas of interest with time, for comparison with allowable exposure limits |
| emission | addition to the atmosphere of foreign matter from stationary or moving sources, e.g. rocket exhaust from a rocket in its trajectory |
| solid propellant | a cured mixture of powdered chemicals, including fuel and oxidizer compounds, and an electrical igniter, formed into cylindrical shape and inserted into the rocket casing. The proportions of the ingredients are selected to provide a given thrust and burning time, but once ignition takes place, the solid propellant combustion cannot be further controlled. |

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Section 1

Introduction

1.1 Purpose and Need

The National Aeronautics and Space Administration (NASA) proposes an increased frequency and size of rocket launches from Goddard Space Flight Center's Wallops Flight Facility (GSFC's WFF). In addition to a Federal Aviation Administration (FAA) licensed Commercial Launch Site (Spaceport), NASA will conduct launches to support national interests, enable low cost space science, and enhance educational opportunities. One additional launch pad and other facility enhancements are necessary to implement this proposal. The proximity of WFF to mid-Atlantic metropolitan areas is depicted in Figure 1-1 "WFF Proximity to mid-Atlantic Areas".

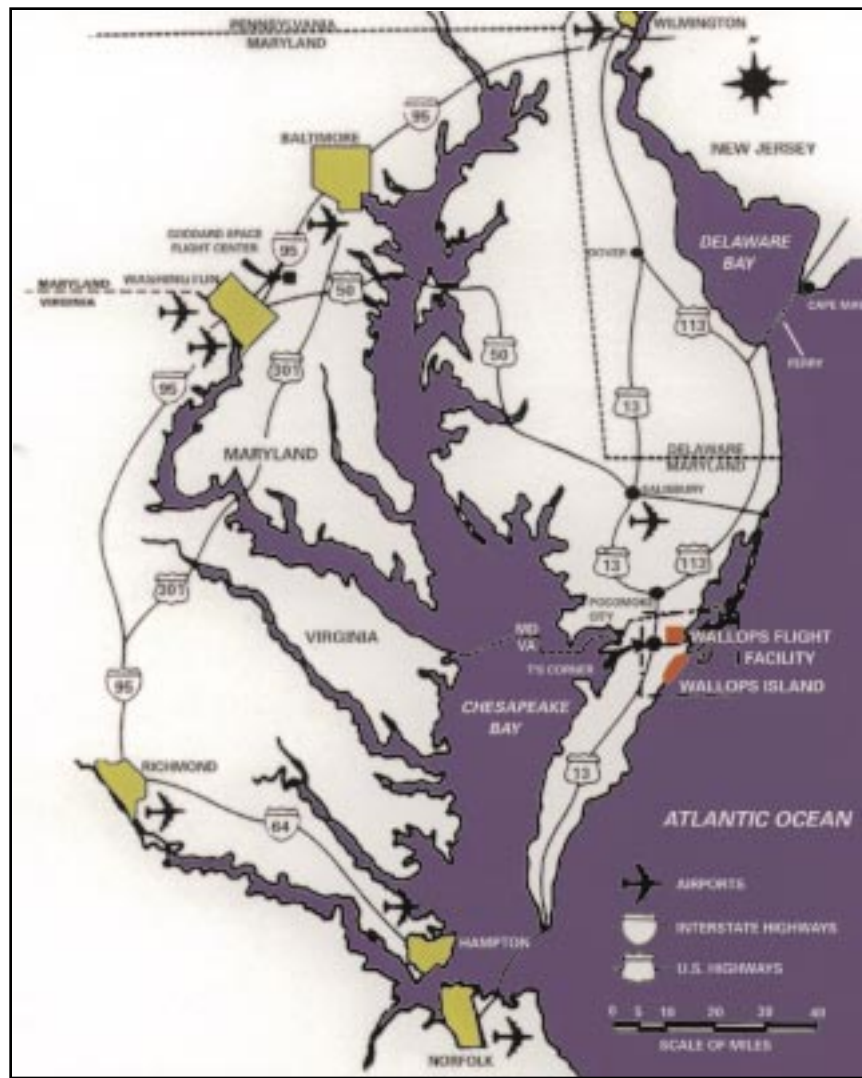


Figure 1-1 WFF Proximity to mid-Atlantic Areas

These improvements would provide accessible, cost-effective and flexible capacity for orbital and sub-orbital launches of commercial, government, and academic payloads, and for other range operations conducted at WFF. This EA also addresses the environmental impacts associated with operation of a licensed commercial launch site at WFF.

Expansion of the WFF launch range and the establishment of a licensed commercial operator at Wallops are necessary to further encourage, facilitate, and promote a competitive United States commercial launch site industry. These improvements at WFF will increase the national capacity for the launch of commercial satellites, and will provide additional capacity for all launch operations from Wallops Island. The proposed annual launch schedule for WFF is anticipated to increase by twelve payloads delivered to low or medium earth orbits. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 (LMLV-3) is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, the LMLV-3 has been selected as a demonstration vehicle to evaluate environmental impacts. The configuration of this launch vehicle is presented in Section 2.1.3. Smaller vehicles would be used where appropriate.

The Commercial Space Launch Act (CSLA) of 1984, now codified at 49 U.S.C. Subtitle IX, ch. 701, recognizes the development of commercial launch vehicles and associated services as being in the national and economic interests of the United States. The Virginia Commercial Space Flight Authority (VCSFA) was established on July 1, 1995, and codified at Sections 9-266.1 et seq., Code of Virginia; its stated purpose is to disseminate knowledge pertaining to scientific and technological research and development among public and private entities, including but not limited to knowledge in the area of commercial space flight, and promote industrial and economic development. The Virginia Spaceflight Center (VSC) is an initiative sponsored by the VCSFA to achieve its stated objectives in the areas of economic development and education. VSC is a multifaceted project which involves two primary business segments: a multi-use Spaceport and a Center for Excellence in research and education in aerospace related endeavors” (Reference 29).

The U.S. Department of Transportation/Federal Aviation Administration/Office of the Associate Administrator for Commercial Space Transportation (DOT/FAA/AST) has been authorized to regulate and license commercial launch operations, while considering public health and safety, national and economic interests, national security, and foreign policies. The FAA is acting as a cooperating agency for the preparation of this EA. The Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) state that upon the request of the lead agency, any other Federal agency with jurisdiction by law in regards to a proposed action shall act as a cooperating agency for the preparation of environmental analyses. In 1986, the DOT prepared a Programmatic EA addressing potential environmental impacts associated with commercial launches. This Programmatic EA recognized the need to prepare site-specific EAs in order to conduct commercial orbital and sub-orbital launch programs. Information from former launches at WFF, from Cape Canaveral Air Station (CCAS) in Florida, and from Vandenberg Air Force Base (VAFB) in California was compiled to cover all aspects of commercial launches. The anticipated impacts in the DOT's Programmatic EA were based upon the launching of the following

Expendable Launch Vehicles (ELVs): Scout, Delta, Atlas, Atlas/Centaur, Titan, and Titan/Centaur.

The only comparable FAA-licensed commercial launch site on the east coast is Spaceport Florida. The FAA Low Earth Orbit (LEO) Commercial Market Projections study (Reference 30), and an internal study performed by Lockheed Martin in 1996, project sufficient demand to support the addition of the Virginia Spaceflight Center, an east coast commercial launch site. Estimates indicate between 140 and 250 launches for LEO systems will occur over the next ten years for new voice, data communication, and remote sensing systems (Reference 30), along with at least ten LMLV missions annually between the years 2000 and 2006 (Reference 29). These projections do not include the continuing market for replacement satellites. VSC anticipates that replacement launches can and should be accomplished in a very cost-effective manner using smaller vehicles such as the LMLV-3, adding to VSC's potential market (Reference 29). Clearly, the availability of commercial launch capabilities must expand to support the upcoming launch market. Considering the existing infrastructure and extensive launch experience, NASA and the VSC believe that from a technical and economic perspective WFF offers the best solution for the needed expansion.

NASA's 1996 Strategic Plan (Reference 26) encourages the transfer of knowledge and technology to private industry, to fulfill the aeronautical needs of the nation. This Plan also outlines goals for the Five Strategic Enterprises comprising NASA. The Space Technology Enterprise (STE) has established Goddard Space Flight Center as the Lead Center for Earth Science. "STE will establish jointly funded partnerships with commercial entities and other Government agencies having a direct interest in utilizing NASA expertise, technologies, facilities, or services. Recognizing the timely requirements of the commercial world, it will rapidly complete agreements and licensing arrangements to stimulate the development and commercialization of technology" (Reference 26). Construction and operation of a commercial launch site at WFF fulfill a crucial element in the realization of this strategic objective. This dynamic commercial partnership with the VCSFA will also realize NASA's missions of technology transfer and promotion of educational opportunities. Such a partnership also corresponds with NASA's interest in reducing the costs associated with access to space, and encourages U.S. private sector commercial expendable launch vehicle operations.

The unique assets and range characteristics available at WFF have traditionally attracted a wide variety of range users. In addition to NASA support operations, the range is utilized by other government agencies, universities, and private industry for conducting rocket and non-rocket programs. This EA, along with the infrastructure improvements and expansion of launch operations, establishes parameters within which performance of these traditional operations may be conducted.

Description of Proposed Action and Alternatives

2.1 Description of Proposed Action

NASA proposes to enhance National launch capabilities through improvements to infrastructure and the expansion of its launch range operations at WFF. The proposed improvements and expansion will provide cost-effective and flexible domestic capacity for orbital and sub-orbital launches of commercial, government, and academic payloads, and for other range operations to be conducted at WFF. The proposed expansion of the launch range operations would occur on Wallops Island which is south of the Wallops Main Base, as shown in Figure 2-1 "Proposed Expansion of Launch Range Operations".

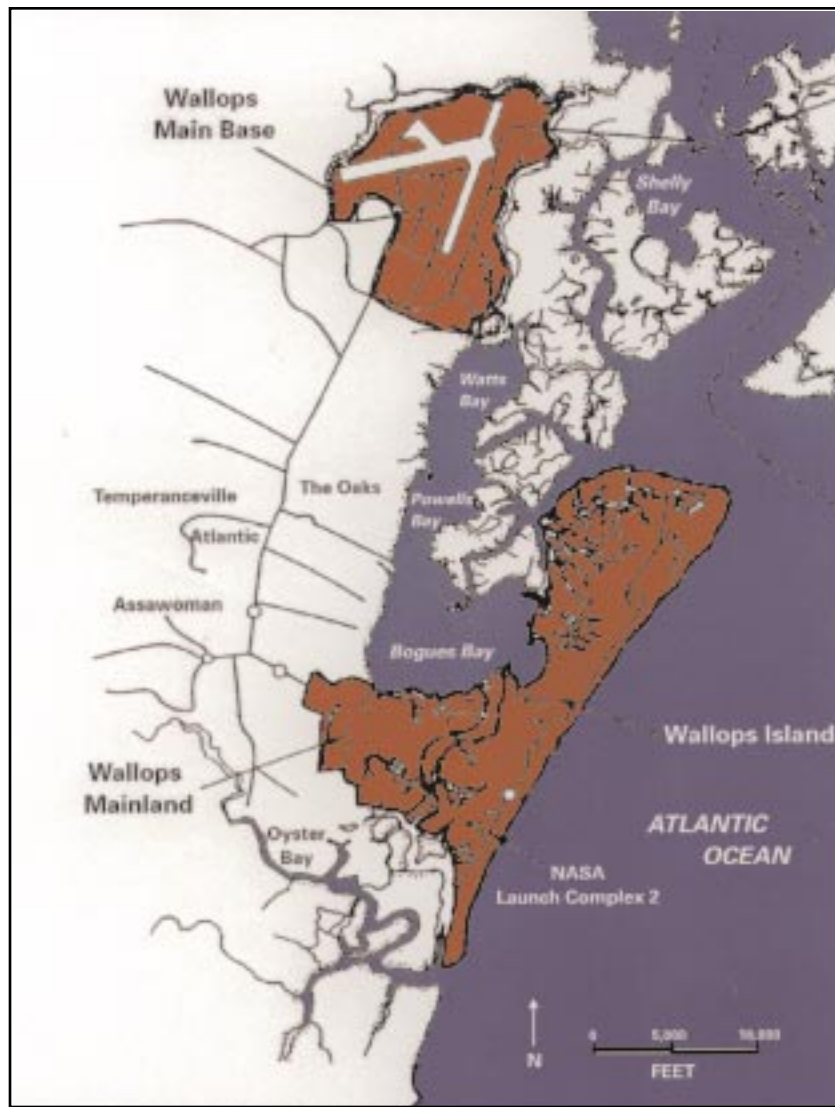


Figure 2-1 Proposed Expansion of Launch Range Operations

The major actions proposed include: (1) establishment of an FAA licensed launch site, to operate from WFF under a Use Agreement with NASA as the host; (2) improvements to real property necessary to support the expansion of launch operations, (3) expanding operations at WFF to accommodate twelve additional orbital launches per year¹; and (4) restoration of the historical level and nature of operations on the WFF range.

The Use Agreement between NASA and VSC provides that VSC (See Appendix F) shall have non-exclusive privileges to operate an FAA licensed commercial launch site at WFF. NASA's WFF would provide guidance, safety, and environmental oversight of the commercial launch site operation via reimbursable service contracts. Under the agreement, VSC would be able to obtain from NASA the following services on a cost reimbursable basis: communications services, including telemetry, tracking, data management and display; safety and management services, such as launch control services; and environmental services, such as hazardous waste disposal and environmental monitoring.

NASA's major responsibilities associated with the proposed actions include: (1) Assessing the environmental impacts associated with the expansion of launch operations to include the establishment and operation of a commercial launch site; and (2) supporting commercial launch operations by providing VSC with mission-critical services that rely on existing range safety, radar and optical tracking systems, telemetry, and communications. An example of a mission-critical facility at WFF is the Control Center, the interior of which is shown in Figure 2-2 "WFF Control Center".



Figure 2-2 WFF Control Center

1. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, this vehicle has been selected as a demonstration vehicle to evaluate environmental impacts.

The FAA will make a license determination regarding VSC's proposed commercial launch site operation at WFF. FAA's major responsibilities associated with the proposed actions include: (1) determining whether to issue a license for the operation of a commercial launch site, and (2) assessing the environmental impacts associated with the establishment and operation of the proposed commercial launch site operations.

VSC's major responsibilities associated with the proposed actions include: (1) obtaining a commercial launch site operator license from the FAA; (2) establishment of a formal Use Agreement with NASA; (3) improvements to WFF's real property necessary to support launch site operations; and (4) operating the commercial launch site.

This EA is an integral part of the FAA licensing process. FAA must consider environmental issues as part of its evaluation of VSC's license application. This EA addresses both the impacts of construction and operation of the commercial facility, as well as range safety issues that may affect the human environment. In addition, VSC must prepare an acceptable license application and obtain a launch site operator license, develop a Commercial Launch Site Explosives Site Plan, a Commercial Launch Site Safety Plan, and tailor the WFF Range Safety Manual for applicability to Commercial Launch Site Operations (Reference 29).

This EA addresses the infrastructure improvements that NASA proposes to make, including the consideration of collateral issues related to the requirements for expansion of range operations at WFF. These issues include potential modifications to the Wallops Island Causeway bridge, potential upgrades to existing roads, and facilities for mobile liquid fuel handling capabilities on the island. Existing activities have been previously determined to have insubstantial impacts other than the improvements made on the island; but more frequent launches of larger vehicles need to be analyzed for their acute and cumulative effects.

The purpose of the expansion of launch range operations is to conduct 12 additional orbital launches per year¹, in addition to the historical level of launches conducted at WFF. Sounding rockets are addressed in the Sounding Rocket Supplemental Environmental Impact Statement [Reference 26]. The orbital launch vehicles to be addressed by this EA utilize liquid and/or solid propulsion systems. However, a solid propulsion system will be used as a demonstration model for this EA since it represents a greater environmental impact than a liquid system. The expanded launch capabilities will not exceed the equivalent environmental impacts associated with launching twelve Lockheed-Martin Launch Vehicle-3's with eight strap-ons [LMLV-3(8)] rockets per calendar year. Any combination of twelve additional orbital launches¹ with acute or cumulative impacts less than or equal to twelve LMLV-3(8) launches per calendar year is within the scope of this EA.

Section 2.1.1 describes the establishment and organizational structure of the commercial Spaceport. This section also outlines the management infrastructure, defining the functional roles and responsibilities of the commercial launch site operations and NASA/WFF as the host organization.

1. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, this vehicle has been selected as a demonstration vehicle to evaluate environmental impacts

Section 2.1.2 describes the proposed improvements to real property necessary to support the commercial spaceflight center. These improvements include modifications to launch pad 0-A, construction of launch pad 0-B, and restoration/modifications to building Z-41 and or other structures for payload processing and integration facilities.

Section 2.1.3 describes WFF's proposed launch range expansion to support various rocket motor configurations, and describes the solid propulsion system chosen as the demonstration vehicle to assess environmental impacts.

Section 2.1.4 describes the extensive space operations history of WFF, first as part of the National Advisory Committee for Aeronautics (NACA) and now as a part of NASA. Today, WFF continues in its support of systems technology, and hardware development. Although the current activity of suborbital launches originating from WFF has declined over the last few years, it is envisioned that the frequency of suborbital launches will return to historical operational levels within the next five-year period.

Section 2.1.5 addresses collateral issues that may arise, during the course of operations, associated with the expansion of launch range capabilities at WFF.

2.1.1 Establishment of a Commercial Launch Site

The Virginia Commercial Spaceflight Authority (VCSFA) was established on July 1, 1995, by the Virginia General Assembly. An eleven member board was formed and granted extensive authority to stimulate economic growth and education through commercial space.

The Center for Commercial Space Infrastructure (CCSI) has been appointed by the VCSFA as Executive Directorate for the establishment and operation of the Virginia Spaceflight Center (VSC). CCSI is the beneficiary of a Center for Innovative Technology (CIT) grant, and acts as the principal operating arm of VCSFA. CCSI has been empowered to enter into agreements with NASA in order to secure facilities, land and services, and to obtain a commercial launch site operator license from the FAA. An organizational chart is shown in Figure 2-3 "Organizational Chart" on page 2-5.

A Reimbursable Space Act Agreement has been established between NASA and the VCSFA concerning the development of a commercial launch site at WFF. The Agreement and associated sub-agreements provide access to WFF and the provision of personnel resources in support of a VCSFA commercial launch site venture. This Agreement establishes the standards under which VSC, the operating arm of VCSFA, can occupy and make improvements to NASA property, and to acquire assistance and services from NASA as necessary (Reference 29).

The establishment of a formal Use agreement (or set of agreements) between NASA and VSC is a critical element for the establishment of a commercial Spaceport. This Use Agreement will establish the standards under which VSC can occupy and make improvements to NASA property, and to acquire assistance and services from NASA as necessary (Reference 29).

VSC is in the process of developing commitments for launch services from both the government and private sectors. They have already been awarded a launch services contract valued up to \$6,000,000 from the United States Air Force. Under this contract, VSC will provide launch services for as many as six missions over the next five years. In addition, the level of

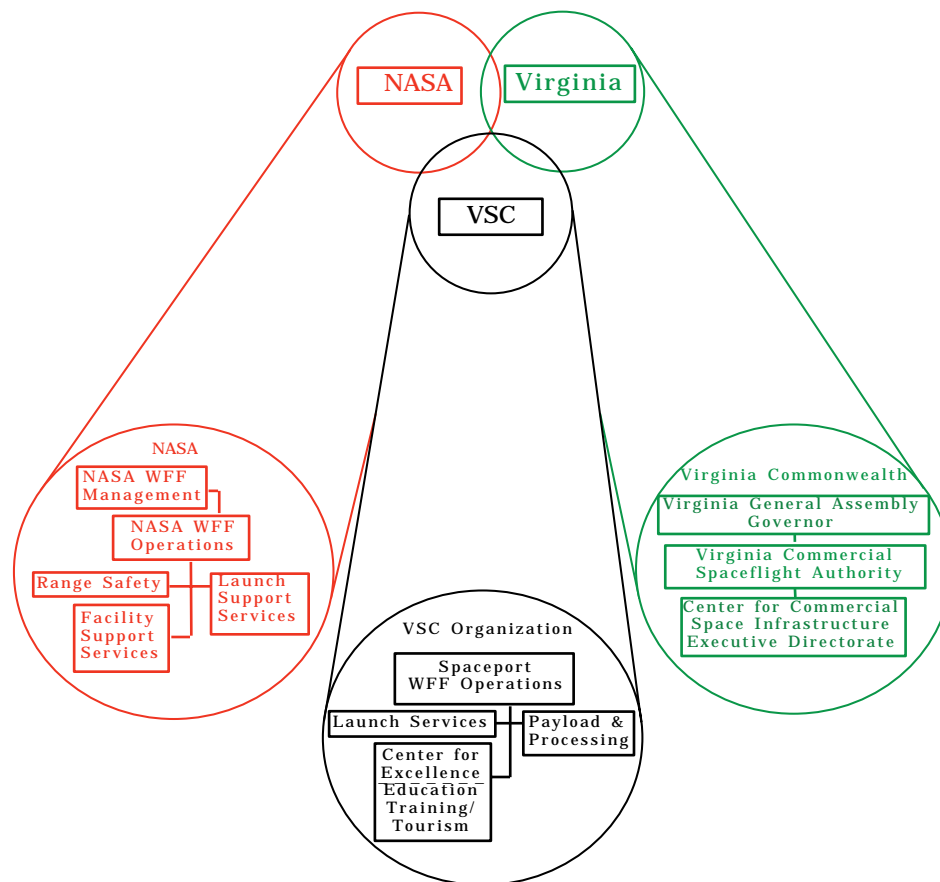


Figure 2-3 Organizational Chart

commitment to the Spaceport by the Commonwealth of Virginia, along with various state and Federal agencies, is demonstrated by the variety of grants and other government funding secured by CCSI (Reference 29).

Old Dominion University's (ODU) Research Foundation and Department of Engineering Management both provide technical and administrative support to the VCSFA/VSC.

2.1.2 Property Improvements

The minimum proposed improvements to WFF's real property and infrastructure necessary to accomplish the proposed expansion include:

- VSC would make minor modifications to the existing Pad 0-A (shown in Figure 2-4 "WFF Launch Pad 0-A" on page 2-6), which would enable start up of launch operations and accommodate various vehicle configurations.
- VSC would make internal modifications to building Z-41 for a Payload Processing and Integration Facility. The original design and utilization of this facility was for the processing of payloads. Modifications to building Z-41 will provide 605.7 m² (6,520 square feet) of capacity for payload processing and integration operations. This facility is located approximately 152.4 m (500 feet) from Pad 0-A and 182.9 m (600 feet) from



Figure 2-4 WFF Launch Pad 0-A

the proposed Pad 0-B, and would supply two high bay payload processing areas with class 100,000 clean work areas, as well as a 13,608 kg (15 ton) capacity bridge crane with a 15.24 m (50-foot) hook height. The facility will include test and evaluation areas to support operations.

- In support of expanded launch operations, minor modifications and enhancements of existing structures, utilities, roads, etc. are anticipated. These enhancements would generally be modernization of existing infrastructure, although some new antennas and support structures may be added to existing developed areas.
- Construction of Launch Pad 0-B: VSC proposes to increase the existing launch capabilities at WFF by constructing a 1,765 m² (19,000 square foot) launch pad. A 51.82 m (170 foot) service tower and other equipment would be attached to this pad to facilitate launch operations. This facility would support the launching of ELV's capable of placing small-to-medium payloads into orbit. Vehicle and payload handling within the pad and service tower area would be accomplished by a 68,040 kg (75-ton) capacity bridge

crane. This new launch pad would be connected to the WFF road system in the vicinity of Building Z-41 by a raised, reinforced roadway.

The areas of expansion are outlined in Figure 2-5 "WFF Proposed Expansion".

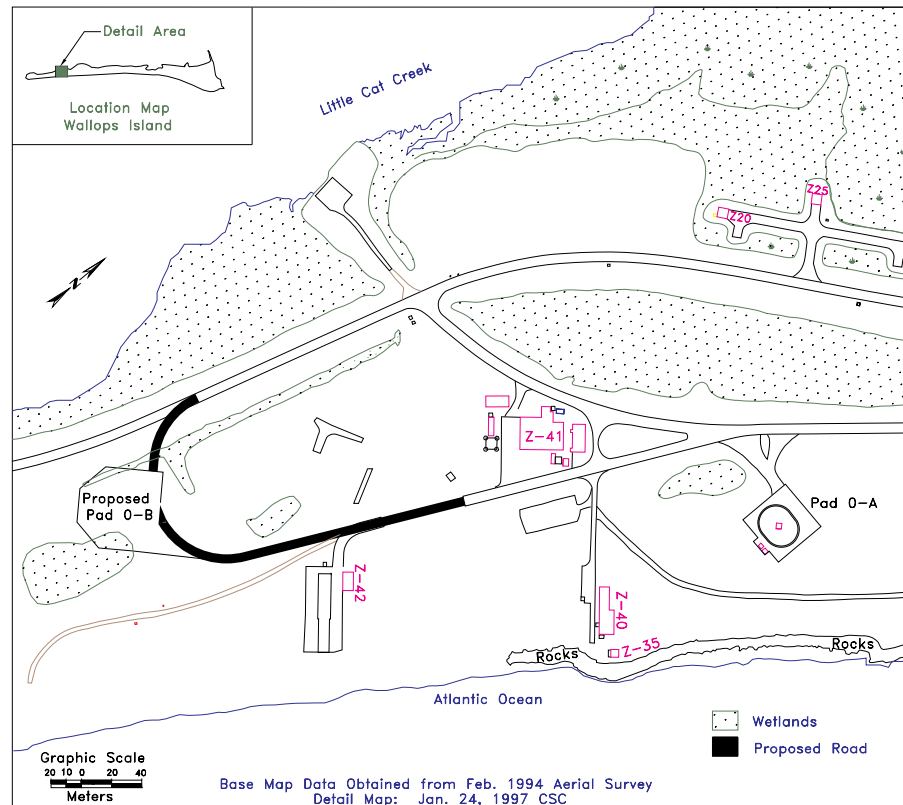


Figure 2-5 WFF Proposed Expansion

2.1.3 Expansion of Launch Range Capabilities

WFF's proposed launch range expansion will accommodate various solid and liquid (liquid oxygen-hydrogen, liquid oxygen-kerosene) rocket motor configurations. However for the purpose of describing potential environmental impacts due to the launching of these systems, the system with the largest ground level emissions capable of being launched from WFF has been chosen as a demonstration vehicle for this EA. A solid propulsion system has been chosen over the liquid propulsion systems because emissions from solid fueled rockets represent the greater environmental impact.

The Castor 120TM is the core motor for several ELVs such as the LMLV-3, Taurus, and an improved version of the Conestoga. The Castor family of motors is used extensively in ELV configurations. This entire family of ELVs suitable for launch from WFF can best be represented by the LMLV-3.

The LMLV-3 has been chosen as the demonstration vehicle that will emit the highest ground level emissions of those vehicles anticipated to be launched from WFF. A Castor 120TM (built by Thiokol Corporation) is the main stage for the LMLVs. The Castor 120TM is a solid propel-

lant rocket motor containing approximately 49,600 kg (109,349 lb) of ammonium perchlorate/aluminum powder in hydroxyl terminated polybutadiene (HTPB). This rocket produces approximately 166,015 kg (366,000 pounds) of thrust and burns approximately 620 kg (1,367 lb) of propellant per second. The final stage of LMLVs is an Orbus 21D (built by United Technology Corporation, Chemical Systems Division) that uses the same type of solid propellant. The major exhaust products from both the Castor 120™ and the Orbus 21D include: aluminum oxide particles, carbon monoxide, hydrogen chloride, nitrogen gas, water, and carbon dioxide.

The LMLV series is available in three versions. The LMLV-1 has a single Castor 120™ motor with an Orbus 21D final stage. The LMLV-2 has two Castor 120™ stages with an Orbus 21D final stage. The basic configuration of the LMLV-3 is an LMLV-2 with

It is anticipated that the highest ground level emissions will emanate from the launch of Castor 120™ and eight Castor IV™ strap-ons.

the addition of two to eight Castor IV™ solid rocket motors strapped onto the first stage. The Castor IV™ contains approximately 10,440 kg (23,016 lb) of the same propellant, and emits the same major exhaust components, as both the Castor 120™ and the Orbus 21D. During lift-off, the strap-on motors fire simultaneously with the main stage, resulting in the anticipated highest ground level emissions from a WFF launch.

The LMLV-3 is approximately 33 m (110 ft.) in height and can weigh up to 194,154 kg (428,036 lb). Payload capability is dependent on the number of strap-on motors utilized, and can range from 3,043 kg (6,710 lb) to 4,073 kg (8,980 lb).

For such commercial ELV launches, in-flight performance will be measured on all launches by on-board sensors transmitting information from the vehicle to ground receivers. Where appropriate, each stage of the vehicle will be equipped with radio receivers and ordnance for in-flight destruction if the flight is determined to be erratic.

The focus of this EA is to analyze acute and chronic impacts to both the local environment and

Addressed by this EA are any combination of twelve additional orbital launches¹ with less than or equal to the acute and/or chronic environmental impact of twelve LMLV-3(8) launches per calendar year.

the lower atmosphere, associated with launching twelve LMLV-3 vehicles (the selected demonstration vehicle) per calendar year. Any combination of twelve additional orbital launches¹ with

emissions and impacts less than or equal to twelve LMLV-3(8) launches per calendar year is within the scope of this EA.

2.1.4 Restore Historical Level of Operations

WFF has an extensive space operations history, initially as part of the National Advisory Committee for Aeronautics (NACA) and more recently as a part of NASA. This long history

1. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, this vehicle has been selected as a demonstration vehicle to evaluate environmental impacts

includes participation in the early development of the space program and manned space flight, substantial orbital launch experience and prodigious suborbital launch experience. Today, WFF continues in its support of launch systems technology, and hardware development.

The first rocket launched from Wallops Island was on June 27, 1945. This rocket was used to analyze the operation and location of tracking stations, examine Doppler radar data, and accrue knowledge in the launching of rockets. WFF has been an integral part of many research and development operations for NASA's orbital and suborbital launches. WFF was instrumental in the first steps towards manned space flight with the successful launch and recovery of "Sam" the Rhesus monkey. Sam was launched on a "Little Joe" rocket (shown in Figure 2-6 "Little Joe" Rocket on Launch Pad at WFF") from WFF on December 4, 1959, to test the



Figure 2-6 "Little Joe" Rocket on Launch Pad at WFF

design of the Mercury capsule. WFF has also conducted high-speed aeronautical research operations which has included aircraft drag investigations, resolution of heat transfer problems, vehicle stability investigations, hypersonic research, space technology development, and space science experiments. WFF has also participated in research for the ballistic missile nose

cone, sounding rocket development, and the development and launching of the Scout satellite launch vehicle (Reference 24).

NASA's Sounding Rocket Program is conducted by the Suborbital Projects and Operations Directorate (SPOD). This program has been evaluated by the Sounding Rocket Supplemental Environmental Impact Statement (Reference 26). WFF has launched approximately 12,000 suborbital research vehicles over the past fifty years. Suborbital launch vehicles vary in size from the small Super Loki meteorological rocket to the four-stage Scout which has orbital capability. There have been forty Scouts launched from Wallops Island, twenty-one of which carried orbital satellite payloads. The other nineteen Scout launches transported suborbital payloads containing probes and re-entry experiments. Figure 2-7 "Average Number of NASA

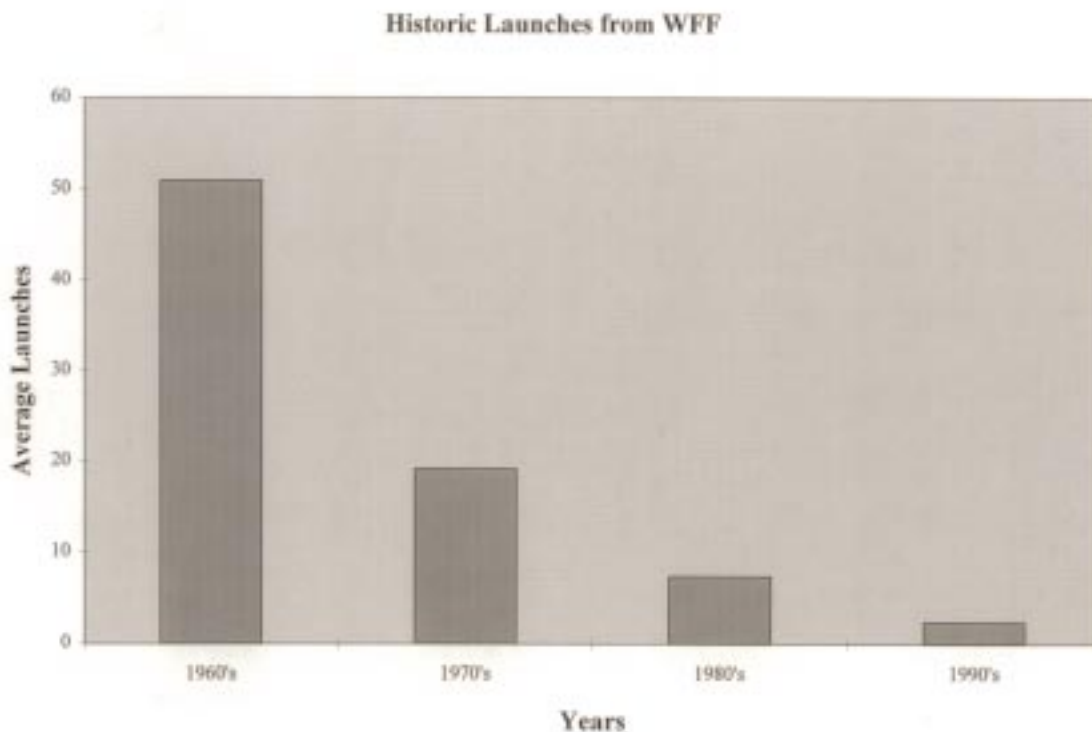


Figure 2-7 Average Number of NASA Sounding Rocket Launches from WFF per Year

"Sounding Rocket Launches from WFF per Year" depicts, from a historical perspective, the average number of sounding rockets launched by NASA per year from WFF. However, aggregate suborbital activity at WFF from NASA, Navy, and other governmental programs and projects has been substantially greater (approximately 70 launches per year).

The number of NASA suborbital launches originating from WFF has declined over the last few years. However, it is envisioned that the frequency of suborbital launches will increase in number and will return to historical operational levels within the next five-year period.

The launch range at WFF extends from Wallops Island eastward into the Atlantic Ocean, utilizing both the surface area and airspace for conducting flight operations. The majority of the

facilities required to fulfill launch operations are located on the southern end of Wallops Island. The launch area includes concrete launch pads, block houses, booster preparation and payload check-out buildings, and other supporting facilities. This area is proposed to be fully utilized in support of future launch range operations.

In addition to NASA support operations, WFF's launch range is utilized by other government agencies, universities, and private industry for rocket and non-rocket programs. Typical programs include: the Naval Air Warfare Center/Aircraft Division (NAWC/AD) VANDAL high speed target missile; U.S. Air Force Sounding Rockets; U.S. Army artillery test rounds; and the first commercial launch from Wallops Island, the EER Conestoga on October 23, 1995.

Increasing WFF's orbital launch capacity would provide efficient, economical satellite deployment. The NASA Strategic Plan discusses research leading to substantial reductions in spacecraft weight. As technology increases, and satellites become smaller, a greater demand for launching small-to-medium payloads will be created. With expanded orbital capacity, WFF will be uniquely positioned for participation in the early development and launching of these smaller satellites. WFF's substantial orbital launch experience includes participation in the development and launch of orbital spacecraft.

2.1.5 Collateral Issues

A thorough review of potential infrastructure requirements or limitations subordinate to the primary actions outlined in this EA resulted in the inclusion of the following collateral considerations. These considerations address actions which may become necessary to sustain the objectives of the primary actions outlined in this EA. The objectives of the primary actions are to provide accessible and cost-effective range operations, including flexible orbital launch capacity for commercial, government, academic, and other research operations conducted on the WFF range.

2.1.5.1 Conveyance to the Island

Conveyance of the larger rockets and payloads anticipated as a result of the expansion of launch range operations, including VSC's, are potentially limited by vehicle loads and curvature of the Wallops Island causeway bridge. The causeway bridge is pictured in Figure 2-8 "WFF Causeway Bridge" on page 2-12. In its present configuration, analysis of the causeway bridge indicates that it is suitable for handling the loads and configurations as indicated in Appendix B.

This bridge analysis summary was performed in October 1995. The existing roadways on the Island are suitable to support any traffic capable of crossing the causeway bridge.

The potential exists for a future requirement to modify the Wallops Island Causeway Bridge, to enhance its load bearing capacity. Such a modification would be carried out in accordance with all applicable permitting requirements, and in coordination with appropriate government agencies such as the U.S. Army Corp of Engineers, U.S. Fish and Wildlife Department, and the Virginia Marine Resources Commission. Modification of the existing causeway bridge, construction of a new bridge elsewhere, or a new transportation route to the island would require additional National Environmental Policy Act (NEPA) review.



Figure 2-8 WFF Causeway Bridge

2.1.5.2 Liquid Fuel Handling

It is anticipated that rocket motors which rely on liquid propellants would be fueled by mobile fueling systems. Presently, the need to install any additional type of permanent storage, distribution or fueling system on the island for liquid fueled rockets is not anticipated. Currently, there is storage capability for handling 208.2 L (55-gallon) drums of fuels and oxidizers on Wallops Island.

2.1.5.3 Range Operations Zone

Active launch range activities at WFF take place along the southern half of Wallops Island. This area has been developed over several decades and contains permanent facilities ranging from roads, a fire department, and various support facilities, to launch pads, block houses, radio towers, radar and optical tracking facilities. This area is defined in Figure 2-9 "Range Operations Zone" as the Range Operations Zone.



Figure 2-9 Range Operations Zone

With the expansion of launch range operations at Wallops, it should be anticipated that requirements for further enhancements or modifications to the infrastructure, and real property (improvements) within the Range Operations Zone may be necessary. Improvements within the Range Operations Zone may consist of the development of mission specific assets, or enhancements to the support or nature of on-going research and launch-related functions.

2.2 Other Alternatives

Presently, Spaceport Florida is the only other U.S. commercial launch site offering comparable economics for orbital inclinations accessible from WFF. The Spaceport Florida launch complex is adjacent to the Cape Canaveral Air Station on the east coast of Florida. The projected east coast commercial launch market considerably exceeds the capabilities of Spaceport Florida. Thus, use of this Alternative would severely limit the opportunities for domestic launch activities.

Both the California and Alaska commercial launch sites are further along in the FAA licensing process. However, the customer base utilizing the West Coast Alternatives is interested in placing satellites into retrograde (east-to-west) and polar orbits. These commercial launch sites are more efficient at providing polar orbit capabilities than the more conventional prograde easterly launch (west-to-east), or equatorial orbits. Safety issues such as launching over populated land masses inhibit easterly launches from the west coast. In order to place a payload into equatorial orbit from the west coast, comparable to one launched from WFF, vehicles much larger than the LMLV-3 would be required due to the need to launch against the earth's rotation. The California and Alaska commercial launch sites do not anticipate utilizing launch vehicles large enough to obtain equatorial orbits. Thus, these launch sites are not considered reasonable alternatives to the proposed action.

The commercial space industry could rely on foreign launch site for launches. Arianespace launches prograde and polar orbit satellites from French Guiana, and there are launch sites in Russia, Japan, China, Canada, and India. The Commercial Space Launch Act (CSLA) of 1984 recognized that dependence on a foreign service for commercial launches would be an economic and technological loss to the United States, and would not be within our national interest. Thus, foreign launch sites are not considered reasonable alternatives to the proposed action.

In addition, WFF is located near the 38th parallel. This latitudinal position offers a technological advantage (over the other alternatives), for reaching equatorial orbit inclinations of 38°-65°. WFF would be the most cost-efficient launch site within the U.S. for delivering low and medium earth orbital payloads requiring these trajectories. The WFF launch range is a uniquely positioned national asset that would be an optimal launch site for unmanned replenishments for the proposed International Space Station slated to orbit the earth at 40°.

2.3 No Action

Under the No Action Alternative, VSC would not upgrade WFF's launch infrastructure and no commercial launch site would be established at WFF. The No Action Alternative would result in a failure to utilize the full potential of the launch range capacity at WFF. The proposed

structural enhancements to WFF are required to support the expanding commercial launch schedule. Selection of the No Action Alternative would not result in a reduction in the world-wide number of commercial launches required by the commercial space industry. However, selection of this Alternative would eliminate the contribution of an important national resource to the competitiveness of the United States.

The Commercial Space Launch Act of 1984 recognized the development of a U.S. commercial launch industry as being in the national and economic interest of the United States. In view of the fact that global development of commercial launch services is occurring, our dependence on a foreign space service would be detrimental to the economic well-being of the country, as well as a loss of technology. Congress has supported the development of a commercial launch industry in the interests of public health and safety, national and economic interests, national security, and foreign policies of the U.S.

Legislation has deemed commercial launches appropriate, considering the benefits to private industry, increased launch capabilities, and our national security. Dependence on a foreign service for commercial launches would be an economic and technological loss to the United States, and would not be in our national interests.

Existing Environment

WFF is a multifaceted research and development facility with particular expertise in launching and utilizing sub-orbital rockets. Used for aeronautics research since 1945, WFF maintains three runways, an active launch range, communications and radar tracking systems, and 556 buildings or structures on approximately 26.3 km² (6,500 acres).

This section provides information with respect to the existing environmental resources on or in the vicinity of Wallops Island that may be affected by the proposed improvements to infrastructure and expansion of WFF's launch range capabilities. WFF's 1994 Environmental Resources Document (ERD) thoroughly addresses environmental resource categories typically included in EAs, and is incorporated by reference into this document. The following subsections will provide a summary of the resources covered by the ERD.

3.1 Air Quality

3.1.1 *Climatic Conditions*

WFF is located in the humid continental warm summer climate zone. Proximity to both the Atlantic Ocean and the Chesapeake Bay act to temper the climate along the Eastern Shore. Temperature and precipitation trends vary with the seasons. WFF's Meteorological Office maintains climatological records. The Eastern Shore can experience severe weather patterns such as hurricanes, northeasters, and thunderstorms that deliver high winds, heavy rainfalls, and reduced visibility.

3.1.2 *Air Quality Standards*

WFF is located in an attainment area for National Ambient Air Quality Standards. Presently, the Commonwealth of Virginia follows the National Ambient Air Quality Standards (NAAQS). The six primary NAAQS pollutants are particulate matter (total suspended particulate less than 10 microns), sulfur oxides, carbon monoxide, ozone, nitrogen dioxide, and lead. The Standards are presented in Section 120-03 of the Virginia Regulations for the Control and Abatement of Air Pollution. The Virginia Department of Air Pollution Control (DAPC) does not currently monitor air quality in the vicinity of WFF. The principal economic activities on the Eastern Shore (farming, forestry, fishing, and food processing) contribute very little to air pollution, and ambient air quality surrounding WFF is excellent. The principal air emissions affecting air quality near WFF are the emissions from WFF itself, described in the following section.

3.1.3 *Potential Emission Sources*

Combustion products from rocket launches are predominantly aluminum oxide, carbon monoxide, hydrogen chloride, water, nitrogen, carbon dioxide, and hydrogen. Emissions are generated through the combustion of fuel and self-contained oxidizers. Under normal launch conditions, emissions are distributed along the rocket trajectory. Emission concentrations are greatest at ground level, and decrease continuously along the flight trajectory.

Aircraft emissions are not covered under the Commonwealth of Virginia regulations governing emissions from mobile sources. The primary emissions of concern are hydrocarbons, which disperse readily in the atmosphere. The volume of aircraft operations at WFF is relatively low.

An Open Burn Open Detonation (OB/OD) area located on the southern end of Wallops Island operates under an Environmental Protection Agency (EPA) interim permitting status. Rocket motors that do not meet launch specifications are thermally destroyed in the OB/OD area. An estimated 68,040 kg (75 tons) of propellant are thermally destroyed in the OB/OD area each year.

The Facilities Management Branch (FMB) operates a paint spray booth on Wallops Island in building X-30. This facility has been inspected by the Virginia Department of Environmental Quality and is in compliance with DAPC regulations for non-criteria pollutant emission rates.

3.2 Noise

Noise sources associated with WFF's activities include commuter traffic, aircraft, and rocket launches. Naturally occurring noise contributing to background levels on Wallops Island includes wind, wave action, and wildlife. Based on site reviews conducted for the Conestoga EA, the predominant noise source in the vicinity of WFF is vehicular traffic. Noise associated with aircraft and rocket launches are considered minor, intermittent sources. A baseline noise survey for the surrounding area is presented in the ERD. Monitoring periods ranged from 15 minutes to 1 hour. Monitoring conducted along Route 803 at the Assawoman Post Office suggest that baseline noise level is between 59 and 64 dBA L_{eq}^1 . Direct sound level measurements in Atlantic, Virginia along Route 803 were taken in September 1996, in conjunction with range activities on Wallops Island. The direct sound levels associated with road noise, measured between 11:00 a.m. and 12:00 p.m., were 124 and 121 dBA.

WFF airfield operations are generally intermittent. A variety of NASA, military, and non-military aircraft utilize the airfield and airspace at WFF. Flight patterns are generally over marshland or farmland, and aircraft are prohibited from creating sonic booms.

Rocket noise has been part of the ambient noise levels over the last 46 years (1990 ERD). Noise levels and frequencies are basically dependent upon the thrust of the rocket motors. The Conestoga launch vehicle is the largest rocket launched from Wallops Island to date. An overall sound pressure level (OSPL) of approximately 107dB resulting from the Conestoga could extend as far as 12.07 km (7.5 miles) from the launch site. (For comparison purposes, close proximity to either a passing truck or a punch press is equivalent to 100 dB and 110 dB, respectively.) The towns of Atlantic and Chincoteague, as well as some farms, are located within this 12.07 km (7.5 mile) radius. The OSPL would be maintained for one to two seconds and then rapidly decrease. Noise levels from rocket launches attenuate rapidly, are low frequency, and occur infrequently. A noise contour map is located in Appendix H.

1. L_{eq} - time average sound energy level

3.3 Water Quality

3.3.1 *Surface Waters*

Surface waters surrounding WFF are saline to brackish, and are classified as Class II (Estuarine) waters by the Commonwealth of Virginia. The Atlantic Ocean, bordering the east margin of Wallops Island, is classified as Class I (Open Ocean) waters. Classifications establish water quality standards for dissolved oxygen, pH, and maximum temperature. In addition, saltwater numerical standards apply to Class I and II waters. These standards along with effluent limitations of point source discharges, are used by the Commonwealth of Virginia to monitor and ensure water quality (Reference 5). Virginia's standards pertaining to surface water are located in the Virginia Administrative Code 9VAC25-260-140. Additionally, Virginia's standards pertaining to dissolved oxygen, pH, and maximum temperature are located in 9VAC25-260-50.

Point source discharges are regulated by Virginia under EPA guidelines and Federal approval. Discharges are allowed with an approved Virginia Pollutant Discharge Elimination System (VPDES) permit. WFF currently holds VPDES Permit No. VA0024457 which authorizes two discharge locations with corresponding effluent limits. Outfall points, designated as 001 and 003 (combined 301 and 302), discharge into unnamed tributaries of Little Mosquito Creek.

3.3.2 *Groundwater*

Four major aquifers underlay WFF. The Pleistocene aquifer is present in the Columbia Group formations. The Pleistocene aquifer is the unconfined water table aquifer that occurs at depths of 1.52 to 18.3 m (5 to 60 feet). Water in this aquifer is influenced by surface waters and recharged by infiltration of precipitation. Next, three individual, confined units comprise the Miocene aquifers of the Yorktown formation. The Miocene aquifers are referred to as upper, middle, and lower corresponding to their position, and begin at depths of about 30.5 m (100 feet). Evaluations of these Pleistocene and Miocene aquifers have indicated good water quality, but the water is moderately hard and with little or no fluoride (Reference 24).

The Mainland and Wallops Island are supplied by two wells that withdraw from the Miocene aquifer. Two shallow wells on the Mainland remain on-line for additional fire protection. The Mainland and Wallops Island system stores pumped water in three water towers for distribution to service connections. The withdrawal permit allows for 480,747 L/day (127,000 gallons/day), 14,903,166 L/month (3,937,000 gallons/month).

Routine analytical sampling of WFF's water systems is performed in accordance with state and federal requirements, and the results are submitted to state authorities for review. Further details on WFF's water systems can be found in References 23 and 24.

3.4 Flora and Fauna

WFF's 1994 ERD (Reference 24) and the 1996 WFF Natural Heritage Inventory (Reference 6) thoroughly characterize the Flora and Fauna of Wallops Island. This EA presents an overview of species inhabiting Wallops Island, as per the ERD and the Natural Heritage Inventory.

3.4.1 *Flora*

Wallops Island is a barrier island maintaining diverse flora communities including beaches, dunes, swales, maritime forests, and marsh.

Few plants are able to thrive in the beach community due to constant wave action. Phytoplankton, macroalgae and algae are prevalent within this community.

Dominant species within the dune community include seabeach orach, common saltwort, sea rocket, american beachgrass and seaside goldenrod. These species are very adaptable to harsh conditions and must contend with high temperatures, high winds, salt, sandblasting and drought.

The southern end of the island contains a swale zone that extends to tidal marsh on the western side. On the northern end, the swale zone is host to northern bayberry, wax myrtle, groundsel-tree and marram which extend to the maritime forest. Loblolly pine and cherry trees with an understory of northern bayberry, wax myrtle, and groundsel-tree are predominant in the maritime forest.

Phragmites australis (common reed), and lawn areas introduced and maintained by man dominate the central portion of the island. Due to successful competition in areas with very low habitat value, the common reed has virtually overrun this section of the island.

The western side of the island is tidal marsh with intertwining guts (small streams). Tidal marshes are low lying wetlands influenced by tides. The low marsh, which is flooded at high tide, is dominated by saltmarsh cordgrass. Salt meadow cordgrass is predominate in the high marsh. Survival of numerous species is dependent upon the tidal marsh. Tidal marshes provide essential plant life for which the chain of marine life is reliant. Countless marine, avian, and terrestrial species depend on the marsh for survival.

3.4.2 *Fauna*

Wallops Island is host to many terrestrial and aquatic species. There are concentrated regions within the tidal marshes where a variety of these species cohabitate.

Calico crabs, fiddler crabs, sand shrimp, moon jelly, and coffee bean snails are invertebrates inhabiting the coastal area of the island. The beach also provides feeding grounds for both the spring and fall migration of shorebirds. Shorebirds found on Wallops during these migratory periods include sanderling, semipalmated plover, red knot, short-billed dowitcher, dunlin, willet, and various species of tern. The upper beach zone is host to foraging laughing gulls, herring gulls, and great black-backed gulls.

The dune and swale zones provide refuge for amphibian, reptile, avian, and mammalian species. Fowler's toad, green tree frog, black rat snake, hognose snake, box turtle, and the northern fence lizard are among the amphibians and reptiles existing in this area. Birds common to the swale zone include various species of sparrows, red-winged blackbirds, boat-tailed grackles, fish crows, song sparrows, gray catbirds, and mourning doves. Mammalian species such as raccoon, red fox, white-footed mouse, meadow vole, white-tailed deer, and the cotton-tailed rabbit also thrive in this diversified area.

White-tailed deer, opossum, raccoons, and gray squirrels find sanctuary in and around the maritime forest region on the north end of the island.

Common fish inhabiting the waters surrounding Wallops Island include the sandshark, smooth dogfish, smooth butterfly ray, bluefish, spot, and flounder. Changes to inlets and channels around the island will influence species diversity in this area.

The tidal marsh is host to an extensive variety of invertebrates, fish, and avian species. The salt marsh grasshopper, tiny planthopper, parasitic flies, wasps, spiders, mites, microarthropods, mosquitoes, greenhead flies, periwinkle snails and mud snails are prevalent invertebrates. Tidal marshes are an excellent nursery ground for various species of fish; eelgrass provides protection for spot, northern pikefish, dusky pipefish, and bay anchovy. Great egrets, snowy egrets, herons, and glossy ibis are among many avian species inhabiting the tidal marsh of Wallops Island.

3.5 Threatened and Endangered Species

The 1994 ERD and the 1996 Natural Heritage Inventory contain listings of threatened or endangered species in the WFF vicinity as of 1992 and 1995, respectively. WFF is obligated to protect any State or Federally listed species discovered on the facility.

Federal or State threatened and endangered floral species have not been identified at WFF. However, Federal or State threatened and endangered birds can be found at various locations on WFF. Grassy areas on the Main Base, such as those adjacent to runways, may be utilized by **upland sandpipers** during migratory season. Although currently inactive, an **American bald eagle** nest exists on the northern border of the Main Base. Of particular interest to the proposed expansion, are areas on the island that have been utilized as migratory breeding grounds for the **piping plover**, **gull-billed tern**, and **Wilson's plover**. A hacking tower on the northwest side of Wallops Island provides a nesting site for a resident pair of peregrine falcons. **Peregrine falcons** have also appeared along the beach during the fall migration.

Both the northern and southern ends of Wallops Island beach areas have been closed during the piping plover nesting season. Nesting activities are monitored by biologists from the Chincoteague National Wildlife Refuge and the Virginia Department of Game and Inland Fisheries.

The current range of operations on the island has little effect on the critical piping plover habitat. WFF's current rocket programs are not nearly as intrusive to the plover habitat as predators and recreational use.

3.6 Health and Safety

WFF maintains 24-hour fire protection on the Main Base and on Wallops Island. Response personnel are trained in hazardous materials emergency response, crash rescue, and fire suppression. A mutual aid agreement has been established between WFF and the local volunteer fire companies for any additional assistance. Initial additional response would be handled by the closest volunteer companies in Atlantic and Chincoteague.

Ground and Flight Safety is responsible for approving project-specific ground and flight safety plans, while management is responsible for approving the Operations and Safety Directive (OSD) for each activity. The following documentation has been prepared to provide specific guidance for emergency response:

- GMI 1771.1, Range Safety Policies and Criteria for GSFC/WFF (Reference 28)
- RMS-93, Range Safety Manual for GSFC's WFF (Reference 22)
- Emergency Preparedness Plan
- Hazardous Waste Contingency Plan and Emergency Procedures
- Spill Prevention, Control, and Countermeasures Plan (SPCC)
- Hydrazine Contingency Plan

A 24-hour security force serves both the Main Base and Wallops island. The security force is responsible for internal security of the base, employee and visitor identification, after-hours security checks, and police services. State, County, and Town officers provide police protection for the surrounding areas.

3.7 Toxic Substances

The Safety, Environmental, and Security Office possesses an inventory of toxic and/or regulated substances in each building at WFF. The applicability of the Toxic Substances Control Act (TSCA) at WFF is limited to the potential presence of materials containing asbestos or polychlorinated biphenyl's (PCB). Trained contractors are present to properly decommission and decontaminate PCB transformers, and to remove small quantities of asbestos during minor maintenance and construction work. Large asbestos removal projects are assigned to off-site contractors specializing in such functions. Further information can be found in the ERD and EBASCO 1994 (References 23 and 24).

3.8 Solid and Hazardous Waste Management and Pollution Prevention

A complete description of solid and hazardous waste management practices at WFF is given in the ERD (Reference 24). The following information is provided as a brief summary of the operations.

3.8.1 Solid Wastes

Solid wastes are collected from dumpsters in various locations of WFF. A private waste contractor performs dumpster collection and disposal. Items such as office paper, cardboard, aluminum cans, and scrap metals are recycled.

3.8.2 Hazardous Wastes

The Environmental Branch manages hazardous wastes at WFF. Hazardous wastes are shipped for proper disposal within 90 days of their initial accumulation date by a NASA-approved contractor.

Generators of waste are trained yearly in recognition, identification, and proper procedures for handling wastes. They are responsible for the following:

- Properly containerizing the waste
- Labeling the waste with the contents, quantity, origin, and date of accumulation
- Forwarding a completed disposal inventory to the Environmental Branch

Inspection, on-site transportation, storage, and shipment of wastes are handled by CSC Environmental Specialists.

The Main Base and Wallops Island / Mainland are designated as two different generation facilities and therefore are assigned separate EPA identification numbers. Also, Wallops Island has a Treatment, Storage and Disposal Facility (TSDF) Permit. The state of Virginia annually inspects the WFF hazardous waste handling operations.

3.8.3 *Pollution Prevention*

In accordance with Executive Order 12856, WFF has an approved Pollution Prevention Program Plan. The WFF plan is based on proactive management of pollution. Pollution prevention provides methods for reducing wastes at the source, and therefore reduces the overall volume for storage and disposal. WFF's goals for pollution prevention are achieved through the implementation of inventory control, material substitution, recycling, process efficiency improvements, preventive maintenance, and improved housekeeping.

3.9 Social Environment

3.9.1 *Population*

WFF is located in Accomack County, Virginia, a rural area with fairly low population densities. Chincoteague Island is the largest populated area near WFF, with a resident population of almost 3,600 people. This serene fishing village, 11.26 km (7 miles) long (north-to-south) and 2.4 km (1.5 miles) wide, is the gateway to Assateague Island National Seashore. Vacationers visiting the seashore inflate the population of this small island to approximately 15,000 during the summer, while special events such as pony penning and the firemen's carnival can increase the population to approximately 30,000.

3.9.2 *Housing*

WFF's government housing consists of two NASA dormitories, and Coast Guard and Navy family housing. Pocomoke City, Maryland, is the nearest area with a substantial number of housing rentals. Chincoteague, Virginia, also has limited housing available, primarily consisting of older single family homes and vacation homes generally available as winter rentals.

3.9.3 *Transportation*

U.S. Route 13 is a four-lane highway spanning the Eastern Shore. WFF is accessible from Route 13 by State Route 175 onto State Route 178, both of which are two lane secondary roads. Traffic is seasonal due to summer tourist traffic.

Norfolk International Airport and the Salisbury Regional Airport provide commercial air service to the region. With proper clearance, chartered and private planes may utilize the WFF airport for business purposes.

The Eastern Shore Railroad provides rail freight; however, passenger service is not available. Ocean cargo shipments are off-loaded at either Cape Charles or at the Port of Baltimore, and then transferred to WFF by rail or commercial trucks.

3.9.4 Recreation

Late spring, summer, and early fall attract numerous tourists and vacationers to the Eastern Shore. Assateague Island National Seashore, with its 24.1 km (15 miles) of pristine shoreline, offers relaxation and recreation for many visitors. The Chincoteague National Wildlife Refuge offers various trails and is home to many native animals including the Chincoteague Pony. The Eastern Shore offers many opportunities for boating enthusiasts during the summer, while winter provides plentiful game for hunters. Bird watchers are in evidence year-round.

Accomack and Northampton counties provide recreation programs at their county park facilities. Many of the Eastern Shore towns are home to historic sites and landmarks. An annual one-day event in April offers a Garden Tour to showcase these historic attractions.

3.9.5 Cultural Environment

3D/Environmental Services, Inc. conducted a preliminary architectural and archaeological survey of WFF. Findings were presented in the *Architectural and Archaeological Cultural Resources Inventory for NASA's Wallops Flight Facility, Accomack County, Virginia (Preliminary Findings)*, December, 1991 (Reference 18).

Currently, WFF has no known resources listed on the National Register of Historic Places. However, two resources on Wallops Island are over fifty years old, the old Coast Guard Station (V-065) and the Observation Tower (V-070), both of which were constructed in 1936.

A review of property history indicates that both Wallops Island and the Main Base have been occupied continuously from the seventeenth century through the nineteenth century. Known prehistoric occupations within the county are well established; therefore, WFF is considered a sensitive area for potential archaeological resources. Phase I archaeological reconnaissance prior to construction activities within the base is mandated by Section 106 of the National Historic Preservation Act.

3.9.6 Public Institutions

WFF maintains a health unit with a full-time nursing staff and a part-time physician, with operational hours of 8:00 a.m. - 4:30 p.m. on workdays. Emergency assistance can also be provided by the Chincoteague Medical Center, and the Atlantic Medical Center. There are four hospitals located within 80.5 km (50 miles) of WFF. These hospitals are the Peninsula Regional Medical Center in Salisbury Maryland which serves as the Eastern Shore's trauma center; Northampton-Accomack Memorial Hospital in Nassawadox, Virginia; McCready Hospital in Crisfield, Maryland; and Atlantic General Hospital in Berlin, Maryland.

WFF maintains a library with a selection of technical, scientific, and managerial resources. Library resources available to the public include the Eastern Shore Public Library in Acco-

mac, Virginia. Libraries in Maryland include branches of the Worcester County Library located in Berlin, Ocean City, Pocomoke, and Snow Hill; Wicomico County Library in Salisbury; and the Somerset County Library System which includes Corbin Memorial Library, Ewell Branch, and Princess Anne Public Library.

Both public and private schools are located in the region. Public school systems in the area include Accomack and Northampton Counties in Virginia, and Somerset, Worcester, and Wicomico Counties in Maryland. Private Schools in the area include the Broadwater Academy and the St. Paul on the Shore Lutheran School in Virginia, and include Holly Grove Christian School and Worcester Country School in Maryland. Several institutions in the area offer programs for higher education. The Eastern Shore Community College in Melfa, and Wor-Wic Tech in Salisbury both offer two-year degrees. Four-year colleges in the area include Salisbury State University in Salisbury, Maryland, and the University of Maryland Eastern Shore in Princess Anne Maryland. In addition, Wallops Island Marine Science Consortium (WIMSC) is located adjacent to WFF, and the Virginia Institute of Marine Science (VIMS) is located in Wachapreague, Virginia.

More than 100 Protestant and three Catholic churches are located in Accomack County. Currently no synagogues or mosques are located in the county. Approximately 100 Protestant, five Catholic Churches, and one synagogue are located in the combined area of Somerset and Worcester Counties.

3.10 Economic Environment

3.10.1 Land

Accomack County land values can vary greatly depending upon proximity to water. Waterfront properties can cost up to ten times more than non-waterfront properties.

For the most part, residential or agricultural lands surround WFF. Approximately ninety percent of the land in Accomack and Northampton counties is made up of woodland, cropland, saltwater bays, and tidal marshes. Five percent of the land is residential, while coastal beaches, industrial, institutional, commercial, and WFF account for the remaining five percent.

3.10.2 Taxes

Both Accomack and Northampton Counties offer tax relief plans for the handicapped and elderly. Taxes in Virginia are assessed on personal property, individual income, retail sales, and corporate income. Both county and town taxes are assessed to persons living in incorporated towns. A four-percent food tax and a two-percent transient occupancy tax is assessed in the Town of Chincoteague.

3.10.3 Labor Force and Income

WFF contributes substantially to the local economy and is the third largest employer in Accomack County. WFF's mean annual income exceeds the mean family income for both Accomack and Northampton Counties. The southern portion of the Delmarva peninsula consists primarily of agricultural and commercial fishing industries, while WFF employment catego-

ries consist largely of managerial, professional, and technical disciplines. The WFF work force is composed of approximately 265 Civil Service and 693 Contractor employees. In addition to the NASA work force, there are approximately 403 U.S. Navy military, civil service, and contractor employees, and 97 National Oceanic and Atmospheric Administration (NOAA) personnel that also work at the facility.

3.10.4 Industry and Services

Electric power to WFF is supplied by Delmarva Power and Light. Heat is provided by a combination of heat pumps, electric heat, or steam heat generated by boilers using Number 2 or Number 6 fuel oil. Potable water for the Main Base, Mainland, and Wallops Island is provided by wells that withdraw from the Miocene aquifer. Wastewater is treated by the Federally Owned Treatment Works (FOTW) located on the Main Base. Operation of the FOTW is in accordance with the Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA00244757. Telecommunications are provided by Bell Atlantic of Virginia with AT&T long distance service.

Gift shops at WFF include the Wallops Exchange and the Visitor Information Center (VIC). Two major shopping centers are located in Onley, Virginia, consisting of department stores and specialty shops. Towns throughout the county also offer smaller shopping facilities which feature specialty foods and gifts. Many Accomack County residents also frequent shopping centers in Maryland cities such as Pocomoke, Ocean City, and Salisbury.

3.11 Land Use

All portions of WFF are zoned industrial by Accomack County with one exception (Reference 24). The area between the Mainland and Wallops Island is classified as marsh land by the County (Figure 10). Land areas surrounding WFF are used primarily for agricultural purposes and single family, residential housing. These surrounding areas are regulated by Accomack County and town councils. The nearest private property to the proposed expansion of launch range operations is approximately 3.2 km (2 miles).

Operations on the Main Base include offices, laboratories, maintenance and service facilities, a NASA-owned airport, air traffic control facilities, hangars, as well as aircraft maintenance, rocket component assembly, storage magazines, fuel storage facilities, and water and wastewater treatment plants. Other structures include Navy operations and housing, Coast Guard housing, and the NOAA Command and Data Acquisition Station. The Mainland hosts antennas and transmitters. Wallops Island is comprised of launch pads and support facilities, and Navy testing structures.

Dispersed throughout the farming areas are small businesses and town facilities. The businesses include restaurants, gas stations, and various branch offices that support WFF's operations. The Town of Chincoteague is a popular summer resort with several motels, hotels, and inns. Please refer to Chapter 4 of WFF's ERD for further information (Reference 24).

3.12 Wetlands and Floodplain Management

Detailed information on wetland and floodplain resources, and their management is provided in References 23 and 24. The following is a brief description on their presence and administration.

3.12.1 Wetlands

All three portions of WFF are bordered by extensive marsh wetland systems. The Main Base has tidal and non-tidal wetlands along its perimeter. They appear in association with Mosquito Creek and Simoneaston Creek. Wallops Island has non-tidal wetlands in its interior, and marsh wetlands on the western edge. Marsh wetlands also fringe the Mainland along Arbuckle Creek. Wetlands are delineated in Figure 2-5 on page 2-7 for the proposed expansion area.

Because Wallops Island is a barrier island containing extensive wetlands, operations and activities on Wallops Island are restricted to protect its valuable and fragile ecology. This is addressed in the GSFC Facilities Master Plan (Reference 20) which presents guidelines to measure and compare the appropriateness of operations and location of facilities to the effect on the island's natural state.

Projects at WFF involving dredging or filling of tidal or non-tidal waters or wetlands require Federal dredge and fill permits (CWA Section 404 permit and River and Harbors Act Section 10 permit) from the Army Corps of Engineers (ACOE). Projects involving the use or development of tidal water or wetlands also require a State wetland permit. The Accomack County Wetlands Board manages the wetlands program for both non-vegetated and vegetated tidal areas.

3.12.2 Floodplain

Wallops Island is entirely within a 100-year floodplain. The 100-year and 500-year floodplain surround the perimeter of the Main Base, along Mosquito and Simoneaston Creek. On the Mainland, the 100-year and 500-year floodplain border its eastern edge along Arbuckle Creek. A floodplain determination for all proposed actions which would be located in, or affect a floodplain must be prepared according to 14 CFR Subpart 1216.2 (Reference 21) and submitted to State authorities.

Boundaries of the floodplains are delineated in the Facility Masters Plan (Reference 20) and the ERD (Reference 24). Wetlands are delineated in Figure 2-5 on page 2-7 for the proposed expansion area.

Environmental Consequences

This section addresses the potential environmental impacts of the proposed improvements to infrastructure and expansion of WFF's launch range capabilities to Wallops Island and vicinity. The sub-sections present the environmental impacts of the proposed action and alternatives.

4.1 Proposed Action

The proposed expansion of launch range operations at WFF provides for orbital launches of commercial, government, and academic payloads, along with other range operations. Impacts of the proposed action will be addressed in this section, along with acute and/or cumulative impacts to Wallops Island and vicinity.

Expansion of the use of various solid and liquid (liquid oxygen-hydrogen, liquid oxygen-kerosene) propulsion systems at WFF is considered to be the primary source of the impacts. For the purpose of describing potential environmental impacts, a solid propulsion system has been chosen over the liquid propulsion system, because solid propulsion systems represent the greater potential environmental impact.

4.1.1 *Air Quality*

4.1.1.1 Ambient Air Quality Standards

WFF is located in an attainment area for all Ambient Air Quality Standards. The federal Clean Air Act (CAA) requires states to adopt and conform to U.S. Environmental Protection Agency (EPA) plans which implement, maintain, and enforce the National Ambient Air Quality Standards.

Virginia's State Implementation Plan (SIP) is being amended to comply with the 1990 CAA Amendments. After the EPA provides final approval of each amendment to the state's SIP, the Virginia Department of Environmental Quality (DEQ) will be fully authorized to enforce that amended portion of the SIP. Presently, the Commonwealth of Virginia follows the National Ambient Air Quality Standards (NAAQS). The six primary NAAQS pollutants are Particulate Matter (total suspended particulate smaller than 10 microns), sulfur oxides, carbon monoxide, ozone, nitrogen dioxide, and lead.

4.1.1.2 Propulsion System Exhaust

The Lockheed Martin Launch Vehicle-3 (LMLV-3) has been chosen as a demonstration system for this EA; the LMLV-3 will produce the highest ground level emissions anticipated from any vehicle to be launched from WFF. The LMLV-3 system consists of a Castor 120™ main stage, with up to eight Castor IV™ solid rocket motors strapped onto the first stage. During lift-off of the LMLV-3, the strap-on motors fire simultaneously with the main stage.

Ground level firing of a Castor 120™ and eight Castor IV™ strap-ons will provide the highest ground level emissions system anticipated to be launched from WFF.

The Castor 120TM is a solid fuel rocket of solid ammonium perchlorate/aluminum powder in hydroxyl terminated polybutadiene (HTPB). The Castor IVTM contains the same fuel as the Castor 120TM. The major exhaust products from the Castor 120TM and the Castor IVTM are aluminum oxide particles (Al_2O_3), carbon monoxide (CO), hydrogen chloride (HCl), nitrogen gas (N_2), water (H_2O), and carbon dioxide (CO_2).

The major constituents of rocket motor exhaust to be addressed in this section are aluminum oxide particles, carbon monoxide, and hydrogen chloride. The other major constituents of rocket exhaust include CO_2 , H_2O , H_2 , and N_2 ; these gases occur naturally in the atmosphere and do not present a substantial environmental impact. There may be trace quantities of other chemicals found in rocket exhaust such as mono-atomic hydrogen, mono-atomic oxygen, and hydroxyl radicals, but these species are chemically unstable, and therefore are short-lived.

The chemical composition of the exhaust is relatively constant throughout the period that the rocket is firing. This results from a homogeneous fuel mixture being maintained throughout the solid rocket motor. The chemistry of the solid rocket motor propellant is the single most important factor in determining the performance, safety, production, and cost of a solid rocket propulsion system. The solid rocket propellant incorporated in the Castor 120TM and Castor IVTM produces exhaust products containing approximately 27% (by weight) Al_2O_3 , 28% CO, and 22% HCl.

The Castor 120TM contains approximately 49,600 kg (109,349 lb) of solid propellant, and burns at a rate of 620 kg (1,367 lb) per second, for approximately 80 seconds. The Castor IVTM contains approximately 10,440 kg (23,016 lb) of propellant and uses 174 kg (383.6 lb) per second and burns for approximately 60 seconds. The LMLV-3 system, configured with eight Castor IVTM strap-ons [LMLV-3 (8)], would contain approximately 133,120 kg (293,479 lb) of propellant. With all eight strap-ons firing simultaneously with the main stage, this system would use approximately 2,012 kg (4,436 lb) of propellant per second for the first 60 seconds and 620 kg (1,367 lb) of propellant for the remaining 20 seconds. The LMLV-3 would leave the launch pad within one second of first stage ignition, and achieve an altitude of approximately 1,000 meters (0.62 mile) after 20 seconds.

Emissions of the rocket motor exhaust constituents of concern [aluminum oxide particles (Al_2O_3), carbon monoxide (CO), and hydrogen chloride (HCl)] emitted in the first 1,000 meters (0.62 mile) are: 11,610 kg (25,596 lb) of Al_2O_3 , 12,040 kg (26,544 lb) of CO, and 9,460 kg (20,856 lb) of HCl.

The air pollutants resulting from vehicle launches are dispersed over a large area within a short period of time. The concentration of emissions vary over the trajectory of the vehicle due to the continuous acceleration of the rocket, with the majority of the emissions occurring at altitude over the Atlantic Ocean. The highest concentration of emissions of concern occurs at ground level, in the vicinity of the launch pad. The concentration of these emissions depends upon the distance from the launch pad and upon the rate of dispersion which is influenced by local meteorological conditions.

The concentration of emissions from rocket launches are typically determined by dispersion modeling. Potential concentrations of the emissions of concern from an LMLV-3 (8) launch at

WFF can be characterized for three meteorological conditions (sea breeze, spring, and fall) based upon modeling for the Scout, Delta, Atlas, and Titan rockets; this modeling was performed using the NASA/MSFC multilayer atmospheric diffusion model (Reference 13). The meteorological conditions are described in Appendix D. The results of this modeling based on actual WFF conditions is directly supported by current dispersion modeling and ground truth testing for actual launches conducted at the Kennedy Space Center. The following assessment is based on the multilayer atmospheric diffusion model for the Delta rocket.

The Delta rocket configuration consists of nine Castor IVTM solid rocket motors strapped onto a liquid oxygen/liquid kerosene main stage. The liquid oxygen/liquid kerosene engine does not emit any HCl or Al₂O₃. The nine Castor IVTM solid rocket motors of the Delta rocket system have a combined weight of approximately 93,960 kg (207,146 lb) of solid rocket propellant, with a burn rate of approximately 1,566 kg (3,452 lb) per second. The LMLV-3 (8) system has a combined weight of approximately 133,120 kg (293,479 lb) of solid rocket propellant with a burn rate of approximately 2,012 kg (4,436 lb) per second. The ratio of the combined weight of solid rocket fuel of the LMLV-3(8) to the Delta is 1.4:1, while the ratio of the burn rate is 1.28:1. Using the conservative ratio of the combined weight (1.4:1), an assessment of the peak concentrations of HCl, CO, and Al₂O₃ from an LMLV-3(8) at a distance of 1,000 meters (0.62 mile) can be made, as listed in Table 4-1 Estimated Peak Concentrations of HCl, CO, and Al₂O₃ from a LMLV-3(8) at a Distance of 1,000 Meters (0.62 mile).

Table 4-1 Estimated Peak Concentrations of HCl, CO, and Al₂O₃ from a LMLV-3(8) at a Distance of 1,000 Meters (0.62 mile)

| Air Pollutant | Meteorological Conditions | | |
|-------------------|---------------------------|------------------------|------------------------|
| | Sea Breeze | Fall | Spring |
| Hydrogen Chloride | 1.12 ppm | 0.22 ppm | 0.21 ppm |
| Carbon Monoxide | 4.2 ppm | 0.77 ppm | 0.7 ppm |
| Aluminum Oxide | 1.70 mg/m ³ | 0.64 mg/m ³ | 0.55 mg/m ³ |

A distance of 1,000 meters (0.62 mile) was selected to assess the potential environmental impacts of an LMLV-3 (8) system launch at the boundary to the nearest sensitive receptor (Piping Plover). However, under spring and fall conditions, peak concentrations of HCl, CO, and Al₂O₃ are anticipated at approximately 1,400 meters (0.87 mile) down range. Table 4-2 Estimated Peak Concentrations of HCl, CO, and Al₂O₃ from a LMLV-3(8) at a Distance of 1,400 Meter (0.87 mile) summarizes the estimated peak concentrations from an LMLV-3(8) at this distance.

A comparison of the estimated peak concentrations of HCl, CO, and Al₂O₃ at a distance of both 1,000 (0.62 mile) and 1,400 (0.87 mile) meters to the Threshold Limit Values-Time Weighted Average (TLV-TWA) for Chemical Substances (Table 4-3 Threshold Limit Values for Chemical Substance), illustrates that the levels of the emissions of concern are well below exposure standards established to protect worker health. TLV-TWA were chosen for comparison purposes since these limits are more conservative than the TLV-Short Term Exposure

Table 4-2 Estimated Peak Concentrations of HC1, CO, and Al₂O₃ from a LMLV-3(8) at a Distance of 1,400 Meters (0.87 mile)

| Air Pollutant | Meteorological Conditions | | |
|-------------------|---------------------------|-----------------------|------------------------|
| | Sea Breeze | Fall | Spring |
| Hydrogen Chloride | 0.25 ppm | 0.33 ppm | 0.25 ppm |
| Carbon Monoxide | 0.9 ppm | 1.1 ppm | 0.9 ppm |
| Aluminum Oxide | 0.58 mg/m ³ | 0.9 mg/m ³ | 0.66 mg/m ³ |

Level (TLV-STEL) exposure indices. Available data show that human health exposure standards are well below levels shown to affect laboratory animals. Based on these comparisons, the launch of an LMLV-3 (8) would not have a substantial effect on humans or wildlife outside of the safety zone.

Table 4-3 Threshold Limit Values for Chemical Substance

| Air Pollutant | Threshold Limit Values - Time Weighted Average ^a | |
|-----------------------------|---|-----------------------|
| | ppm | mg/m ³ |
| Hydrogen Chloride | 5 (CL) ^b | 7.5 (CL) ^b |
| Carbon Monoxide | 22 | 29 |
| Aluminum Oxide ^c | --- | 10 |

- a) Threshold Limit Value - Time Weighted Average: The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
- b) CL (Threshold Limit Value - Ceiling Limit): The concentration that should not be exceeded during any part of the working exposure.
- c) as Aluminum.

Source: American Conference of Governmental Industrial Hygienists, 1995-1996. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*.

There have been extensive investigations into the acute and cumulative effects of space shuttle launches from Kennedy Space Center. Exhaust products from the two solid rocket boosters (SRB) have been identified as the primary environmental concern associated with these launches.

Each of the shuttle SRBs contains approximately 498,950 kg (1,099,996 lb) of solid propellant for a system total of 997,900 kg (2,199,993 lb), as compared to 133,120 kg (293,479 lb) of solid propellant for the demonstration vehicle used in this EA. During the first ten seconds of launch, approximately 17,000 kg (37,479 lb) of HCl are released in the exhaust of the two SRBs.

The ground level acute and chronic impacts associated with the space shuttle launches far exceed the impacts associated with the exhaust products of the launches addressed in this EA. The impacts are substantially greater for the shuttle due to the volume of exhaust products and the use of an exhaust deluge system for the shuttle.

Acute impacts due to exhaust products from the shuttle have been documented for each shuttle mission. In all cases, these effects have been limited to an area approximately 400 square meters (4,306 ft²) to the north of the launch pad (Reference 16). Collection and analysis of exhaust product deposition from three shuttle missions (STS-11, STS-13, and STS-14), representing a variety of meteorological conditions, supports the results of the NASA/MSFC multi-layer atmospheric diffusion model for launches at WFF. This ground truth testing demonstrates near-dissipation of exhaust products at ground level at a distance of 500 meters (1,640 ft).

4.1.1.3 Fugitive Emissions

Fugitive emissions of hazardous or ozone depleting materials are not anticipated during normal range operations. There will be levels of unavoidable dust during construction phases. The transportation, handling, storage, and transfer of hazardous and toxic materials such as hydrazine will be addressed through the Ground Safety Section of each mission-specific "Operations and Safety Directive."

Operations and Safety Directives include general mission information along with information on range support, support services, payload recovery, aircraft operations and safety, a ground safety plan, flight safety plan, and countdown procedures.

Spaceport activities would rely on existing hydrazine transfer equipment, or support from the facility's range safety office to ensure safe and proper transportation, handling, storage, and transfer. Mission-specific uses of small amounts of solvents may be anticipated; however, all hazardous waste such as unused solvent, spent solvent, and used rags contaminated with solvent would be stored in sealed containers which would be managed and disposed in accordance with applicable state and federal regulations.

Minor growth in corrosion control activities can be expected with increased launch activity. This growth could increase the usage of the paint spray booth on Wallops Island in building X-30. However, emissions would remain within the current Virginia Department of Environmental Quality permitted values.

4.1.2 Noise

Wallops Island is approximately 11.26 km (7 miles) long and 0.8 km (0.5 mile) wide, and is surrounded by water. It is comprised of 17 km² (4,200 acres) including the 9.1 km² (2,240 acre) land area and the 7.93 km² (1,960 acre) marsh area which spans the entire western border of the island. The Atlantic Ocean borders the island to the east, with Chincoteague Inlet to the north. Wallops Island has been joined to Assawoman Island since 1986 when an inlet between them was closed by a storm.

The launch areas on the island are located approximately 4.02 km (2.5 miles) from the mainland. The marshland and water surrounding the island act as a buffer zone for noise generated during rocket launches. The noise levels generated during launches depend principally upon

the thrust level of the rocket motors. To date, the largest rocket launched from Wallops Island was the Conestoga. This vehicle was projected to have an overall sound pressure level of approximately 107 dB as far as 12.06 km (7.5 miles) from the launch site. The towns of Atlantic and Chincoteague, as well as farms, are located within this 12.06 km (7.5 miles) radius. A noise contour map is located in Appendix H. While some observers may, under appropriate atmospheric conditions find the noise from a launch to be an annoyance, the noise is maintained for only one to two seconds, is of low frequency, attenuates rapidly, and occurs infrequently. The public will be notified in advance of launch dates.

Public participation in a noise monitoring study was solicited for an activity conducted at Wallops Island in September 1996. This activity resulted in repetitive noise events over the course of a day; the peak noise registered at the source was 146 dB. There was an 87 per cent response rate with no substantial negative replies from the members of the public participating in the study. Background noise levels measured in the community the day prior to the event reached as high as 115 dB. Waterfowl were also observed and recorded by video over the course of this entire event, to determine if the noise from the range activities had any observable effect. Video recordings were reviewed by U.S. Fish and Wildlife representatives, and there was no observed effect on the waterfowl.

There will also be noises created during construction. These noises will be low-level and are not anticipated to have any substantial effects on wildlife.

4.1.3 Water Quality

Water quality impacts due to the launching of small-to-medium ELVs were assessed in the 1986 DOT Programmatic EA (Reference 13). Sources contributing to impacts on water quality associated with the proposed actions may include: (1) Wastewater Treatment Plant (WWTP) discharges; (2) stormwater runoff; (3) impacts from spent ELV stages; (4) construction; (5) accidental release potential; and (6) groundwater contamination.

4.1.3.1 Wastewater Treatment Plant Discharges

Wastewater generated at Wallops Island is pumped through a forced main to the Federally Owned Treatment Works (FOTW) located on the Main Base. The FOTW operates under a Virginia Pollutant Discharge Elimination System (VPDES) permit number VA0024457. The FOTW has adequate capacity to manage the additional wastewater generated by the projected increase to range operations, and the present volume is substantially less than the permitted daily discharge. A new facility is slated to become operational by the summer of 1998. Discharges from the FOTW are monitored to ensure that concentrations of specific analytes remain within the limits of the permit.

4.1.3.2 Stormwater Runoff

In accordance with the VPDES permit, WFF has prepared a Stormwater Pollution Prevention Plan (SWPPP) which describes erosion, sediment, and stormwater management controls, as well as best management practices designed to minimize discharges of pollutants via stormwater. NASA has conducted many studies for evaluating the effects of hydrogen chloride and aluminum oxide on the environment. Stormwater runoff may contain aluminum oxide particles that have accumulated from the launch of solid rocket motors. However, aluminum oxide is not considered a hazardous substance by the Environmental Protection Agency (EPA). Alu-

minum oxide particles have been known to accumulate water vapor and hydrogen chloride gas to form acidic droplets. In the event a storm occurs immediately following a launch, the potential for runoff with a low pH may exist.

However, due to the potential of lightning strikes, the launching of vehicles the size of an LMLV-3 under adverse weather conditions will not occur, thus reducing the probability of a storm event immediately following a launch. Monitoring events at Kennedy Space Center have noted a slight decrease in pH for surrounding estuarine surface waters, lasting one to two hours. Rapid recovery to baseline conditions occurs due to the pH stability associated with estuarine waters (Reference 16). From an environmental perspective, Launch Complex 0 is the most sensitive launch area on the island. Launch Complex 0, which includes both Pad 0-A and proposed Pad 0-B lies between the Atlantic Ocean and Hog Creek. Launch pad 0-B will be equipped with a flame duct to direct the flame towards the Atlantic Ocean, which should help minimize impacts to the marshland and Hog Creek that lie west of the pad. Due to the proximity of these bodies of water, the pH of the surface water may slightly decrease for one to two hours after launch as a result of either ground cloud emissions or stormwater runoff. However, changes in water quality should be negligible to none, due to the buffering capacity of estuarine waters (Reference 15). Surface water in the vicinity of launch complex 0 will be monitored for pH of Class I (Open Ocean) and Class II (Estuarine) waters are provided in the Virginia Administrative Code 9VAC25-260-50 along with dissolved oxygen and temperature regulatory limits. These standards are presented below in Table 4-4 "Virginia Standards for Dissolved Oxygen, pH, and Maximum Temperature".

Table 4-4 Virginia Standards for Dissolved Oxygen, pH, and Maximum Temperature

| DESCRIPTION Class of Waters | DISSOLVED OXYGEN (mg/L) | | pH | TEMPERATURE |
|------------------------------------|-------------------------|---------------|----------------|--------------|
| | Minimum | Daily Average | Range | Maximum (°C) |
| I Open Ocean | 5.0 | NA | 6.0-9.0 | NA |
| II Estuarine Waters | 4.0 | 5.0 | 6.0-9.0 | NA |

NA: Not Applicable

4.1.3.3 Spent ELV Stages

Corrosion of jettisoned or reentered hardware is a potential source of pollution to marine environments. However, toxic concentrations of metal ions are not produced because the corrosion rates are slow in comparison to the mixing and dilution rates associated with marine environments. Insufficient quantities of unspent propellants may fall into the ocean. Unspent solid propellant will dissolve slowly, and impacts to marine life are expected only in the immediate vicinity of the remaining propellant, if at all. Unspent liquid propellants such as liquid oxygen and liquid hydrogen pose no toxic threat to the marine environment. However, liquid fuels such as kerosene which are relatively insoluble in water pose a slight risk to the marine environment until evaporation occurs. The insubstantial quantity of propellant would form a thin film that would be broken up by wave action, sunlight, and oxygen. All traces of propellant would quickly dissipate within 1 to 2 days. Due to the insubstantial quantity of liquid fuel

remaining in reentered hardware, no substantial environmental effect is expected. The presence of miscellaneous materials such as battery electrolytes and hydraulic fluids are in such small quantities that only temporary effects would be expected (Reference 13).

In the event of a launch failure, debris from reentered hardware could impact the ocean much closer to shore than would occur with a successful launch. The 1986 DOT Programmatic EA addressed launch failures, and determined that the probability of such an event is extremely small (estimated at 1% probability). Therefore, such an event should not pose a substantial environmental impact.

4.1.3.4 Construction

Soil erosion contributes to non-point source pollution. Management of non-point source pollutants is required under Section 319 of the Clean Water Act, as amended. The SWPPP provides best management practices for the prevention of soil erosion. Soil erosion from construction sites has the potential to reach surrounding bodies of water which could cause an increase in turbidity. Mitigation measures, such as filter barriers and sediment fences, will be implemented during construction activities to minimize these impacts (Reference 10).

4.1.3.5 Accidental Release Potential

The probability for accidental release of rocket propellant in the early stage of flight is small (estimated at 1% probability). Rockets launched from WFF are equipped with radio receivers and ordnance for in-flight destruction if the flight is determined to be erratic. The system is designed to terminate rocket motor thrust upon activation; however, it is possible that a portion of the fuel may fall into the ocean. Due to the low toxicity of ammonium perchlorate leaching from the propellant, impacts to marine life would occur only in the immediate vicinity of the propellant, if at all. Toxic concentrations of ammonium perchlorate would be quickly dissipated by the ocean currents. The 1986 DOT Programmatic EA (Reference 13) discusses the accidental release of an entire load of kerosene from an Atlas rocket into the ocean. An Atlas is a liquid-fueled main stage rocket which is substantially larger than any rocket expected to be launched from Wallops. Evaporation of the thin film of liquid propellant released from an Atlas rocket is rapid. While evaluating the accidental release from an Atlas, the DOT determined that "due to the relatively small area involved and fleeting nature of the phenomena, no significant environmental effect is expected" (Reference 13). The 1986 DOT Programmatic EA also addressed the near-shore (shallow water) accidental releases from Titan and Delta rockets. Although this event might be regarded as a substantial environmental impact, such an extreme event is not considered likely. "Since the probability of such an event is extremely small, there should not be a significant impact" i.e.: 1% probability (Reference 13).

4.1.3.6 Groundwater Contamination

The proposed activities on Wallops Island could possibly contaminate groundwater by pollutants leaching into the aquifer, or by depletion from overuse. The probability of operations associated with launch facilities polluting regional aquifers has not been documented (Reference 13). In order to minimize potential groundwater contamination associated with operations conducted at WFF, a Spill Prevention, Control, and Countermeasures Plan (SPCC) has been prepared. This plan outlines best management practices and operational procedures for

the prevention and control of spills and or leaks. The rocket launches under consideration do not require the use of deluge water (sound suppression water spray); therefore, groundwater supplies should not be threatened by the proposed action.

4.1.4 *Flora and Fauna*

The primary impacts to flora and fauna in the vicinity of the launch pad result from exhaust products such as gases and fire as well as noise. The most sensitive launch areas on the island, from an environmental perspective, are the launch pads comprising Complex 0. Since the largest rockets anticipated being launched from the island will be from this complex, the following analysis pertains to this area. Impacts to flora and fauna at the smaller launch complexes on the island will be even less substantial. Damage to local biological resources, resulting from launch activities, can be anticipated within a 1,000 meter (0.62 mile) radius of the launch pad. Radial distances from the launch pad are illustrated in Figure 4-1 "Radial Distances from Launch Pad"; an enlargement of the environmental impact area is shown in Figure 4-2 "Envi-

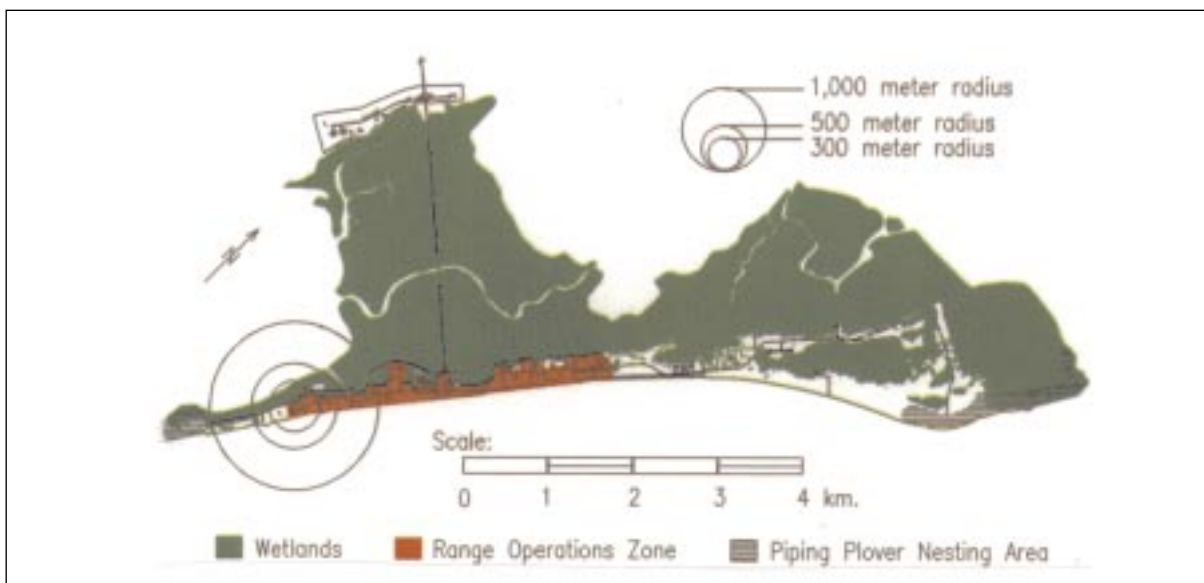


Figure 4-1 Radial Distances from Launch Pad

ronmental Impact Area" on page 4-10. The principal impacts radiate approximately 200 to 300 meters (656 to 984 feet) within the combustion path. Searing of vegetation and injury or death to fauna can occur within this zone. Interruption of faunal activities is expected within a 1,000 meter (0.62 mile) radius of the launch pad, for 2 to 10 minutes during launch operations (Reference 13).

The configuration of launch complex 0-B employs a flame duct that will direct the combustion products and initial sound blast towards the ocean. The majority of this area is beach with little to no vegetation to be disturbed by the combustion path.

Exhaust emissions of hydrogen chloride produce short-term acidic conditions, and can result in plant mortality adjacent to the launch pad. Studies of near-field effects of Space Shuttle launches on vegetation reveal that thick cuticled species and grasses that are adapted to harsh salt environments are more tolerant to launch conditions than certain shrub species. Therefore,

vegetation bordering the launch complex can have a tendency to evolve into grass or herb communities. Wax myrtle is common in the vicinity of the proposed launch complex, and are fairly resistant to near-field effects. This tolerance should prevent transformation of the floral community (Reference 15). Other than construction, there would not be disruption to indigenous species within the Range Operations Zone.

Noise generated from rocket launches is generally low-frequency and of short duration. It is anticipated that the avian population of Wallops Island will be disrupted more so than other species. Temporary interruption of foraging and nesting activities in the immediate area of the launch pad may occur. Due to the short duration of the noise disturbances, "impacts to these species is considered minimal" (Reference 15).

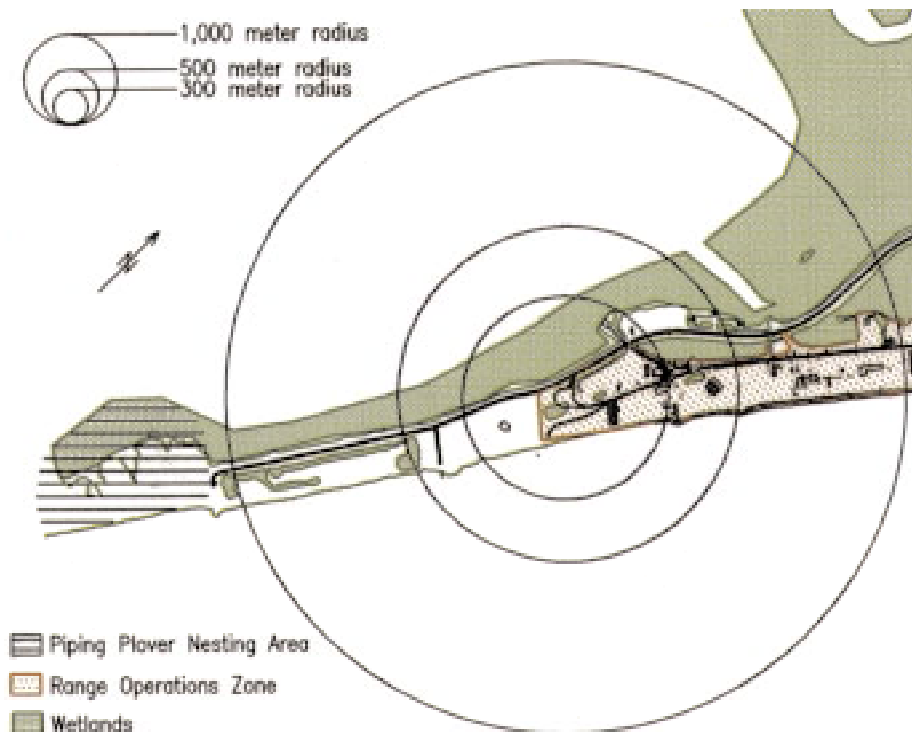


Figure 4-2 Environmental Impact Area

4.1.5 *Threatened and Endangered Species*

Piping plover nesting areas have been designated just above the tide line on both the northern and southern ends of Wallops Island. Both the gull-billed tern and Wilson's plover have been found nesting in these areas. As with other avian populations, temporary interruption of foraging and nesting activities may occur as a result of launch activities. The nesting area designated on the northern end of Wallops Island is approximately 7 km (4.35 miles) from the projected expansion, and is not expected to be impacted by emissions or noise. However, the plover area on the southern end of the island is approximately 1,000 m (0.62 mile) from the projected Range Operations Zone. The southern plover area may be impacted by the temporary interruption of foraging and nesting activities. However, noise generated from rocket launches is generally low-frequency, of short duration, and occurs infrequently. Naturally occurring background noises in the nesting area such as wave action and thunderstorms are

more frequent and of longer duration than noise from a rocket launch. In addition, emissions from the largest anticipated rocket launched from WFF that would reach the nesting area are well below the exposure standards for the protection of human health, and human health-based standards are well below levels shown to affect laboratory animals.

A formal section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) was conducted for the piping plover. It is the USFWS's biological opinion that WFF's proposed action is not likely to jeopardize the continued existence of the piping plover on Wallops Island. To ensure the well being of this species, the USFWS has prepared a monitoring plan for the first three launches from pad 0-B to occur during the piping plover nesting season. More detail on this plan is provided in section 5 of the EA, and the consultation is presented as Appendix G.

A peregrine falcon hacking tower was constructed by the USFWS on the northwest section of the island. The tower is located in a remote marsh area and is far removed from the Range Operations Zone. Falcons utilizing this habitat should not be substantially impacted while nesting; however, a temporary interruption of foraging could occur while they are hunting within the Range Operations Zone during launch activities.

The federally and state listed species located within the boundaries of WFF are protected by management activities to maintain or enhance the viability of these species. The occurrence of protected species should not impact either the primary mission of WFF, or secondary land use activities (Reference 6). WFF will continue to consult with the Department of Conservation and Recreation-Division of Natural Heritage and/or the Department of Game and Inland Fisheries as programs evolve. These meetings will be utilized as management tools to resolve potential conflicts with proposed activities occurring in the vicinity of habitats for listed species.

4.1.6 Health and Safety

The establishment of ground and flight safety guidelines are the responsibility of the National Aeronautics and Space Administration. WFF's Range Safety Branch is responsible for implementing these safety guidelines. NASA document number RSM-93, the *Range Safety Manual for Goddard Space Flight Center (GSFC)/Wallops Flight Facility (WFF)* outlines the 1) Ground and Flight Safety Requirements, 2) Range User and Tenant Responsibilities, and 3) Safety Data Requirements to which all range users must conform.

To ensure the safety of personnel, property, and the public, WFF requires all range users to submit formal documentation pertaining to their proposed operations for safety review. Mission-specific safety plans will be prepared by WFF's Ground and Flight Safety Groups. These plans address all potential ground and flight hazards related to a given mission, in accordance with the Range Safety Manual. This manual also specifies that all systems be designed such that a minimum of two independent and unrelated failures must occur in order to expose personnel to a hazard. It is the responsibility of the Range Safety Branch to coordinate review of the proposed operations with all applicable organizations. Risks to human health and safety will be completely addressed and managed by these plans.

As a tenant, the commercial Spaceport and its clients would be required to comply with all of WFF's existing safety regulations. In addition, FAA licensing procedures require the Commer-

cial Operator to prepare a Spaceport Explosives Site Plan, a Spaceport Safety Plan, and tailor Spaceport Operations for compliance with the WFF Range Safety Manual.

4.1.6.1 Ground Safety

The Ground Safety Plan outlines operational management procedures for minimizing risks to human health and the environment. These procedures are in addition to the Occupational Safety and Health Guidelines outlined in 29 CFR 1910. Guidelines which specifically pertain to federal employees are outlined in 29 CFR 1960. Ground safety focuses on potential hazards associated with activities such as fueling, handling, assembly, and checkout for all pre-launch activities. System designs and safety controls are established to minimize the potential hazards associated with the operations of a launch range. The Ground Safety Plan addresses the following areas (Reference 22):

- Hazardous Materials Handling
- Explosive Safety
- Personal Protective Equipment (PPE)
- Health and Safety Monitoring
- Training
- Operational Security, Controls, and Procedures

The majority of issues covered by the ground safety plan deals with worker protection. To ensure the safety of personnel, property, and the public, the use of quantity distances and other protective engineering controls would continue when dealing with explosives and/or other hazardous materials. Along with the other issues addressed by ground safety, the handling of liquid fuels represents a potential environmental impact. Thus far, a solid rocket system has been presented by this EA as demonstrating the greatest environmental impact. However, solid and liquid fueling procedures are substantially different, and therefore present diverse risks.

The proposed expansion of operations could attract users with requirements for launching vehicles utilizing solid rocket motors, liquid propellant engines, or combinations of the two. Solid rocket motors have a well-established history of use and are relatively stable. Customers will have sealed solid rocket motors shipped to WFF for vehicle assembly.

The potential exists for launching rockets with engines utilizing liquid fuels (liquid oxygen-hydrogen, and liquid oxygen-kerosene) from WFF. Based on current infrastructure configuration, liquid fuels would be transported by tanker for direct loading into the launch vehicle. Liquid oxygen is a commercial material handled in vast quantities. Cryogenic liquids, if spilled in large quantities, could cause local damage due to their being intensely cold. Liquid oxygen may explode if improperly mixed with combustible materials such as liquid hydrogen, and the gaseous oxygen evaporating from a liquid spill will intensify existing fires. Long-term environmental impacts have not been reported due to spills of liquid oxygen (Reference 13). The cryogenic risk associated with the use of liquid hydrogen is similar to liquid oxygen.

Kerosene is routinely handled at WFF. The greatest risks associated with the use of kerosene are attributable to spills or leaks. Procedures outlined in the Spill Prevention Control and Countermeasures Plan (SPCC) will be followed while fueling systems with kerosene.

Hydrazine is typically used as a propellant for vehicle attitude control systems. The utilization of hydrazine has already been employed on missions originating from WFF. Storage and transfer of hydrazine will be in accordance with WFF's Hydrazine Contingency Plan.

WFF's Range Safety Manual states that bi-propellant systems shall be designed so that mixing cannot result if either the fuel or oxidizer subsystems malfunction. In general, liquid propellant systems shall be designed to prevent inadvertent mixing, especially where chemical reactions could lead to catastrophic consequences.

4.1.6.2 Flight Safety

The Flight Safety Plan outlines flight management procedures for minimizing risks to human health and the environment. Flight safety focuses on the flight of the launch vehicle and ensures that safety criteria are met at all times. WFF coordinates all operations with the FAA, U.S. Navy, Coast Guard, and other organizations as required in order to clear the potential hazard areas. Advisories to mariners (NOTMARS) and airmen (NOTAMS), listing restricted or hazardous areas, shall be made at least twenty four hours prior to launch. All launch limitations are published in the Flight Safety Plan.

To protect the public, range participants, and property from missions conducted at the WFF range, certain risk criteria have been established. The following risk criteria shall not be exceeded for any mission, unless supported by an approved Safety Analysis Report (Reference 22).

- Casualty expectation for all mission activities shall be less than 1 in 1,000,000.
- Casualty expectation for mission personnel shall be less than 1 in 100,000.
- Probability of hitting a ship shall be less than 1 in 100,000.
- Probability of hitting an aircraft shall be less than 1 in 10,000,000.

A preliminary flight trajectory analysis is completed prior to each launch, to define the flight safety limits for guided and unguided systems. Vehicle systems with Flight Termination Systems (FTS) will be terminated by destruction of the vehicle if the flight is deemed erratic, or transverse the established destruct boundary. All stages are required to be equipped with flight termination systems unless the maximum range of the vehicle is less than the range to all protected areas, or the vehicle is determined to be inherently safe (Reference 22).

Flight termination boundaries are designed to ensure that vehicle destruction occurs within a predetermined safety zone. This safety zone is established for the protection of the public, personnel, and the environment. In addition, while failures have occurred in the past, the 46 year history of WFF offers no evidence of acute or cumulative environmental impacts as a result of launch failures.

4.1.7 Toxic Substances

Payload processing may require limited use of chemicals considered toxic under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Reference 15). A chemical inventory list will be provided to WFF's Safety, Environmental, and Security Office prior to the arrival of such substances. The greatest risks associated with these substances are accidental leaks or spills. Mission-specific safety and environmental plans, as well as WFF's Spill Prevention Control and Countermeasures Plan (SPCC), are in place to prevent or minimize any impacts associated with accidents involving toxic and or hazardous substances. Potential toxic corridors are defined in mission-specific Operations and Safety Directives. These hazard zones are designed to protect personnel, environment, and the public.

4.1.8 Solid and Hazardous Waste Management and Pollution Prevention

Increasing WFF's launch range capacity will result in the generation of domestic, industrial, and hazardous wastes. Industrial solid waste management will endure acute impacts associated with construction activities. In order to support expanded launch range operations, property improvements must ensue, increasing the amount of industrial solid waste for a brief interval. Over the longer term, wastes generated by payload processing operations in building Z-41 should not overtax the existing solid waste management system.

Hazardous wastes are unavoidable aspects of launch operations. Limited amounts of hazardous wastes, such as chemical solvents and some waste hydrazine, are necessarily associated with the preparation of launch vehicles. The small amount of waste generated will not substantially increase existing hazardous waste volumes, and would be segregated and handled through proper disposal routes. WFF is registered as a "large quantity generator" of hazardous waste. Mature programs for addressing hazardous waste and hazardous materials already exist. The incremental increase in hazardous waste requirements, associated with the primary actions of this EA, are well within the capabilities of the existing infrastructure for handling hazardous waste at WFF. In addition, WFF would continue to monitor existing and proposed activities and programs to ensure compliance with the pollution prevention program objectives.

4.1.9 Social Environment

The projected increase in launch-related population is not substantial. Permanent staffing requirements for the VSC will be on the order of 10 - 12 personnel. It is anticipated that launch customers will bring 15-20 temporary personnel, requiring lodging in local motels and hotels. The surrounding areas have adequate infrastructure to accommodate the anticipated influx of personnel (both permanent and temporary) traveling to and from WFF.

Conventional transportation routes will be utilized for the conveyance of launch vehicle components from suppliers to WFF. These launch vehicle components will not be excessively wide loads or hazardous. Transportation of all vehicle components will be in compliance with the DOT regulations without special exceptions.

The launch range is surveyed prior to every launch to ensure public safety. NASA also coordinates with local fishermen and recreational boaters prior to launch activities. Activities do not

proceed until the launch area has been cleared of craft, in order to minimize impacts to humans. NASA's radar and communication equipment provide positive benefits to the local population by contributing efficient ship-to-shore communications in cases of emergency (Reference 24).

WFF complies with the National Historic Preservation Act Section 106 by coordinating with the Commonwealth of Virginia Historic Preservation Officer prior to any construction activities. Currently, WFF has no known resources listed or eligible for listing on the National Register of Historic Places (Reference 18). Constructed in 1969, the original nature and use of building Z-41 was as a vehicle processing facility. The Department of Historic Resources has been contacted by the VCSFA (Reference: Letter from the Department of Historic Resources in Appendix C) about construction of Launch Pad 0-B on the south end of the island. According to the VCSFA's consultation with the Department of Historic Resources, there are no archaeological sites or historic structures present in the immediate area of the proposed launch pad. However, one archeological site is adjacent to the project area. This site will be monitored during construction activities to ensure its integrity. The proposed action will not affect any property listed or eligible for listing on the National Register of Historic Places.

NASA has embraced Executive Order 12898 by incorporating Environmental Justice (EJ) into their mission. WFF has prepared a site-specific EJ Implementation Plan which identifies programs and federal actions that may disproportionately and adversely affect minority and low-income populations around WFF. Based upon the data presented in WFF's EJ Implementation Plan, federal actions conducted at or by WFF do not disproportionately or adversely affect low-income and minority populations.

Certain flight trajectories from WFF's northern launch pads require closure of the southern end of Assateague Island. NASA has an established agreement with the Chincoteague National Wildlife Refuge for such closures. Southern launch pads minimize the necessity for these closures. The value of the Chincoteague National Wildlife Refuge in terms of its significance and enjoyment is not substantially reduced or lost due to launch activities at WFF.

Educational systems in the surrounding areas benefit from WFF's expertise. WFF offers educational tours for schools and other organizations, as well as WFF personnel lecturing at schools, and judging school science fairs. It is anticipated that the expansion of launch range operations will introduce additional educational and recreational experiences for both local residents and tourists.

4.1.10 Economic Environment

The local community currently benefits from NASA's presence through a steady source of employment (both Civil Service and contractor personnel), and increased revenue for businesses. As the third largest employer in Accomack County, WFF's presence is beneficial to the local economy by providing an increased tax base. Expansion of operations at WFF would result in increased employment demands, thus benefiting the community as a substantial source of employment. Expansion of operations also results in increased tax revenues, thereby providing further growth for the local economy (Reference 24).

The proposed expansion of operations, as well as the additions to WFF's infrastructure, would create employment opportunities in various areas of expertise. Local contractors would princi-

pally be utilized for the construction of the new launch pad, roads, modifications to building Z-41, and added utilities. Spaceport operations would be supervised by a permanent staff of two VSC personnel. Daily operations of the Spaceport would be managed by a contracted operator with a staff of 8 - 10 personnel. NASA would provide launch support services to VSC, and to other customers in the form of range safety, radar and optical tracking systems, telemetry, communications, command and destruct systems, and utility services. With reductions in NASA funding, commercial launch operations could help finance government and contractor jobs that might otherwise be lost to downsizing.

Expanding the operations at WFF would benefit local businesses and communities. Operation of a commercial Spaceport alone would increase the amount of goods and services needed by non-local employees. Private industries utilizing the WFF's range for a launch campaign would temporarily relocate a staff of approximately 15-20 personnel for periods of roughly 30 days, during which time food, lodging, and material goods will be needed. Taxes generated by this influx of personnel will directly benefit the local communities.

The nation's space programs were previously conducted entirely by the Federal Government. Commercial space programs operating under the authority of the Commercial Space Launch Act of 1984 will now assume responsibility for missions that are vital to the technological and economic well being of the country (Reference 14). As a result of these activities, the Commonwealth of Virginia, NASA, and the commercial space industry would benefit. A highly competitive, self supporting, viable Spaceport located at WFF would provide: (1) economic growth and development through the creation of jobs and the attraction of space-related industries; and (2) the propagation of research, education, training and technology transfer under the auspices of the Center for Excellence (Reference 29).

4.1.11 Land Use

The extensive space operations history of WFF dates back to 1945. WFF has been zoned for industrial use by Accomack County with one exception. The land between the Wallops Island and the Mainland has been classified as marshland by the county. This proposed expansion of operations remains consistent with prior land use and activities.

Land resources within the Range Operations Zone may be disturbed while conducting the necessary property improvements for expansion of operations. A review process has been established to minimize potential negative impacts from land development. This review process requires the completion of a preliminary environmental survey by the proponent. The survey is reviewed by the WFF environmental office, regarding activities conducted within the Range Operations Zone prior to the commencement of any improvements (See Appendix A). This survey provides an interdisciplinary approach to decision making for further improvements within the Range Operations Zone, and facilitates the documentation of decisions while providing an opportunity for recommendations of public involvement/notification.

Future improvements within the Range Operations Zone would be coordinated with appropriate government agencies such as the U.S. Army Corp of Engineers and the U.S. Fish and Wildlife Service, and in accordance with all applicable permitting requirements. Final documentation of decisions to proceed with such improvements within the Range Operations Zone, necessary to support the functions within the scope of this EA, will be addressed by the appropriate National Environmental Policy Act (NEPA) documentation such as: Categorical

Exclusion (CATEX), Record of Environmental Consideration (REC), Environmental Assessment (EA), or an Environmental Impact Statement (EIS).

4.1.12 Wetlands and Floodplain Management

The procedures for evaluating NASA actions having an impact on floodplains and wetlands are provided at 14 CFR subpart 1216.2. These procedures follow the basic criteria established in the Floodplain Management Guidelines for Implementing Executive Order 11988 that were published in Volume 43 of the Federal Register page 6030 (43 FR 6030). The basic criteria outlined in 43 FR 6030 are as follows:

- Avoid long- and short-term adverse impacts associated with the occupancy and modification of floodplains and wetlands.
- Avoid direct or indirect support of floodplain and wetlands development, wherever there is a practicable alternative.
- Reduce the risk of flood loss.
- Minimize the impact of floods on human health, safety and welfare.
- Restore, preserve and protect the natural and beneficial values served by floodplains and wetlands.
- Develop an integrated process to involve the public in the floodplain and wetlands management decision-making process.
- Incorporate the Unified National Program for Flood Plain Management.
- Establish internal management controls to monitor NASA actions to assure compliance with the Orders.

The proposed construction site for launch pad 0-B has been delineated for wetlands; the wetlands survey is shown in Appendix E. The delineation process has determined that construction at the proposed site will have an impact on 1,280 square meters (approximately 1/3 acre) of low quality wetlands. Wetlands will be established or improved to compensate for the loss created by the project. Mitigation measures for compliance with the “no net loss” wetlands policy are presented in Section 5.

The most practical site for the proposed launch pad is on the southern end of Wallops Island. This site was selected for Range Safety and environmental reasons. Development of the proposed orbital launch complex within the developed range operations zone is not a feasible alternative due to range safety issues associated with inhabited buildings and proximity to existing structures. Orbital launches from a location on the northern end of the island would require flight trajectories over Assateague Island, and impacts to wetlands. Sites south of the proposed location result in a larger loss of wetlands, and the possibility of emissions and noise impacting the piping plover nesting area. Therefore, no practicable alternative exists for the proposed location of Pad 0-B, which would partly (1,280 m² (1/3 acre)) be located in a wetland. Wetlands are delineated in Figure 2-5 on page 2-7 for the proposed expansion area.

Construction activities on Wallops Island will impact a floodplain area since the island is situated within the 100 year floodplain. WFF maintains a seawall constructed of stone and filter

cloth on the eastern side of the island to protect the shoreline from erosion. The proposed location of the new launch pad 0-B is located just south of the existing seawall. The roadway to the pad and pad 0-B will both be reinforced to protect the structures from flood loss.

The VSC will receive Federal funds from the U.S. Department of Commerce, Economic Development Administration (EDA) for their proposed construction activities. Therefore, VSC must comply with the Coastal Zone Management Act of 1972, and construction must be consistent with the Virginia Coastal Resources Management Program (VCRMP). The Commonwealth of Virginia has made the determination that the proposed action is consistent with the VCRMP. However, this decision stipulates that applicable permits and approvals listed under the Enforceable Programs of the VCRMP would be obtained by VSC prior to initiating any construction associated with the commercial Spaceport. In addition, the proposed project may require a permit from the Army Corp of Engineers (Reference: Letter from the Department of Environmental Quality in Appendix C). Permits will be required from the following VCRMP programs:

- Wetlands Management Program - administered by the Marine Resources Commission.
- Dunes Management Program - administered by the Marine Resources Commission
- Non-point Source Pollution Control - administered by the Department of Conservation and Recreation

The public is involved in the floodplain and wetlands management decision-making process through the publishing of public notices as required by the National Environmental Policy Act (NEPA) and the permitting process for work in waters and/or wetlands within the Commonwealth of Virginia.

4.2 No Action Alternative

The No Action Alternative would not eliminate the nature of business activities conducted at WFF. However, it would severely impact future opportunities for the launch range, surrounding community, and the United States. Failure to utilize WFF to its fullest potential eliminates a valuable resource to the competitiveness of the United States space industry.

The primary impacts associated with the No Action Alternative would be economic. The economic growth associated with expansion of operations and the commercial Spaceport would be lost to other launch sites. In addition, NASA would not benefit from sharing range infrastructure operations and maintenance costs with commercial users. The primary beneficiaries of this alternative would be foreign governments since current east coast launch capabilities are severely limited, and cannot meet projected demands. Dependence on current federal launch capabilities or foreign space programs would be detrimental to the economic well-being of the country and is not considered within our national interest.

Mitigation and Monitoring

WFF would introduce mitigation and monitoring measures which are intended to reduce or eliminate environmental impacts which could be attributed to the improvements to infrastructure and to the expansion of the range of operations. The measures are designed to offset the consequences inherent in the construction and in the range activities associated with the operations of a launch facility. The mitigation and monitoring measures described in the following sections include management controls and engineered systems required by environmental regulations. Consultation with Federal and State agencies concerning further mitigation and monitoring events would be conducted as needed.

5.1 Noise

Mitigation measures would be required to protect workers from excessive noise at the launch facility during both construction and operations. Although predicted noise levels during construction are below OSHA noise limits, construction firms would be required to address hearing protection in their submitted work and safety plans. During launch operations, safety zones would be established by Range Safety. Personnel would be removed from the immediate launch area, and would be required to remain outside the hazard zone or in designated safe areas. The hazard zone would remain closed to all personnel until reopened by Range Safety (Reference 22). The public will be informed beforehand on the planned dates for launches.

5.2 Water Quality

Soil erosion is a contributing source of water pollution. The WFF SWPPP describes erosion, sediment, and stormwater management controls, as well as best management practices designed to minimize discharges of pollutants via stormwater. All operations subject to stormwater shall implement the preventive measures presented in the SWPPP. A mitigation plan involving vegetative management and erosion control would be implemented for all construction and renovation activities, to protect soil resources from erosion. Examples of soil erosion mitigation measures that would be applied to activities in the Range Operations Zone such as launch pad construction and building renovations include:

- Site preparation - Preservation and protection of vegetation, soil preservation, and dust control.
- Surface stabilization - Temporary and permanent seeding, use of mulches, fabric, mesh, and gravel blankets on slopes.
- Sediment barriers - Straw bale barriers, sediment fences, and rock barriers at the toe of cut and fill slopes adjacent to wetlands.
- Protection of soil and fill storage piles

Cut and fill techniques are employed to increase the width and reduce slope angles, to minimize soil erosion and resulting turbidity in adjacent surface waters. Areas disturbed would be revegetated and the removed soil stockpiled for use in subsequent landscaping efforts, to

restore areas impacted by these activities. Final grading, site revegetation and drainage would be designed to minimize surface water impact from runoff and potential spill incidents which may occur during site operations.

Foundations would be designed to resist maximum seismic loads and overturning moments induced by wind loads. In an effort to further stabilize structures, peat deposits and wet soils would be removed to a sufficient depth and be replaced with suitable fill material. This technique would prevent differential settling and frost heaving of structures and roadways.

The SPCC plan provides guidelines for implementing the WFF procedures for spill prevention, spill response, and spill control. Based on current infrastructure configuration, liquid fuels would be transported by tanker for direct loading into the launch vehicle, reducing the probability for leaks or spills which could be associated with cryogenic storage tanks. All fueling operations would be overseen to ensure that contractors exercise caution during fuel transfers in order to minimize releases. The Fire Department, the Environmental Branch, and the Facilities Management Branch (FMB) Emergency Response Team (ERT) are committed to ensure timely response and clean-up in the event of a spill.

The pH of surface water in the vicinity of launch complex 0 may be slightly decreased for brief periods after launch as discussed in Section 4.1.3.2. Therefore, estuarine surface water in the vicinity of launch complex 0 will be monitored to detect and quantify any deviations in pH. The data will be compared to the Virginia water quality standards listed in Section 4.1.3.2 and used to facilitate any future decisions regarding mitigation or regulatory control of storm-water associated with launch complex 0.

5.3 Threatened and Endangered Species

Two federally listed species have been identified on Wallops Island by the United States Fish and Wildlife Service (USFWS). The peregrine falcons nesting on the north end of Wallops Island should not be impacted by the activities taking place in the Range Operations Zone. The piping plover is the second endangered species listed, and resides on the island during nesting season. NASA closes both the northern and southern ends of Wallops Island during each nesting season, which lasts from March 15th through September 1st.

Interruption of foraging activities may occur within 1,000 m (0.62 mile) of the launch pad during launches. There are no known endangered species within this zone; however, the southern piping plover nesting area is adjacent to this 1,000 m (0.62 mile) zone. The USFWS has prepared a monitoring plan for the piping plover as part of the formal section 7 consultation. Monitoring of the piping plovers at the south end of Wallops Island will occur during the first three launches from pad 0-B that take place between March 1, and September 15. In accordance with this monitoring plan, observation of the piping plovers will take place for 7 consecutive days prior to the launch, during (as dictated by human safety considerations), and for 7 consecutive days after the launch. A summary report will be submitted to the USFWS within ten days of the last day of monitoring for each event. Depending on the results of the surveys, additional monitoring may be required at the discretion of the USFWS. Thus far, activities on the island have not affected the piping plover breeding grounds.

5.4 Wetlands and Floodplain Management

NASA Policy Directive 8800.16 states that NASA shall comply with all pertinent statutory and regulatory environmental requirements and Executive Orders. Executive Order 11990 Wetlands Protection states:

Protection of Wetlands, requires Federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. EPA's Statement of Procedures on Floodplain Management and Wetlands Protection requires EPA programs to determine if proposed actions will be in or will affect wetlands. If so, the responsible official shall prepare a floodplains/wetlands assessment, which will be part of the environmental assessment or environmental impact statement. The responsible official shall either avoid adverse impacts or minimize them if no practicable alternative to the action exists.

The location of the proposed launch pad was delineated to determine potential wetlands impact. Delineation findings indicate that 1,280 square meters (approximately 1/3 acre) meets the three Army Corps of Engineers (ACOE) criteria for wetland determination: 1) hydrology, 2) dominant vegetation, and 3) soils characteristics. The area is noted as a low quality marginal non-tidal wetlands dominated by *Phragmites australis* (common reed) and no longer supports indigenous hydrophilic flora species.

To offset the loss of wetlands caused by construction or renovations in the Range Operations Zone, a wetlands permit and mitigation plan would be prepared after consultation with ACOE, the Commonwealth of Virginia, and the Accomack County Wetlands Board. After the mitigation plan is prepared, wetlands would be created or enhanced to offset the loss. The mitigation site would be monitored periodically thereafter to verify that the offset is maintained.

No adverse cumulative impacts to wetlands are anticipated from the Proposed Action or other ongoing activities at WFF. WFF currently follows a "no net loss" policy as implied in NASA Directive 8800.16 with regards to wetlands, and is evaluating the possible establishment of a wetland bank to deal with future disturbances of wetland areas due to mission activities. In the short term, the establishment of a wetland mitigation bank would lead to an increase in overall wetland area, although the surplus wetland area could be reduced over time as other wetlands are disturbed. Such changes in wetland area would be minor in comparison to the existing wetland area at Wallops Island. Currently, the Range Operations Zone contains less than 5% by area of potential wetlands (areas designated as potential wetlands based on the presence of hydrophilic flora only). These potential wetland areas consist primarily of low quality non-tidal areas dominated by *Phragmites australis* (common reed). *Phragmites*, though good for erosion control, crowd out indigenous flora and reduces fauna nesting and food sources. Implementation of a wetland bank would enhance the overall quality of wetlands on Wallops Island, creating a better environment for the development of indigenous flora and fauna.

The seawall on the eastern side of Wallops Island is designed to protect the shoreline from erosion, as well as protecting the island infrastructure. The proposed construction site for launch pad 0-B is located just to the south of the existing seawall. Both the roadway leading to the new pad and to pad 0-B would be reinforced to protect the structures from flood loss.

Section 6

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- 16) Environmental Management Vol. 14, No. 4, pp. 501-507. *Quantification of Hydrochloric Acid and Particulate Deposition Resulting from Space Shuttle Launches at John F. Kennedy Space Center, Florida, USA*. Prepared by The Biogenetics Corporation.
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Appendix A

Preliminary Environmental Survey

Table 8-1 Preliminary Environmental Survey

| | | |
|---|----------------------------------|--|
| RANGE OPERATIONS ZONE PRELIMINARY ENVIRONMENTAL SURVEY | | For Environmental Branch Use Only |
| Section I: Request | | |
| 1. To: 205.3 NEPA Program Manager | 2. From: (Code and Organization) | 3. Document Number |
| 4. Requestor: (Name, Title, and Phone Number) | | 5. Est. Comp. Date |
| 6. Title of Proposed Action | | |
| Section II: Proposed Improvement or Activity | | |
| 7. Purpose and Need (Attach additional pages if necessary) | | |
| 8. Description of Proposed Improvement or Activity (Attach additional pages if necessary) | | |
| 9. Estimated Cost \$_____ | | |
| 10. Organizational Approval | Signature | Date |

| RANGE OPERATIONS ZONE PRELIMINARY ENVIRONMENTAL SURVEY | | | | | | | | | | | | | | | | | |
|---|------------------------------------|--|--|--|----------------------------------|-----------------------|------------------------------------|---------------|---------------|---|--|-----------------------|------------------------------------|---|---|---|---|
| Section III: Worksheet | | | | | | | | | | | | | | | | | |
| 11. a. How much property will be taken for new or modified facilities? _____ b. Will any facilities be located in floodplains, wetlands or water bodies? _____ c. Will there be any clearing or site grading? _____ d. Will there be any use of herbicides or other pesticides? _____ e. Will the activity take place outside of the ROZ? _____ | | | | | | | | | | If the answer to any part of question 11 is yes, please explain in the Remarks section. | | | | | | | |
| Instructions: Indicate the effect either on or of each appropriate attribute listed below. Additional attributes may be listed in the "Remarks" section. + = Positive Effect; 0 = No Effect; - = Adverse Effect; U = Unknown Effect | | | | | | | | | | | | | | | | | |
| Proponent | | | | | Environmental Office | | | | | | | | | | | | |
| 12. Attribute | | | | | + | 0 | - | U | 12. Attribute | | | | | + | 0 | - | U |
| Physical Factors | Wetlands | | | | | Physical Factors | Wetlands | | | | | Physical Factors | Wetlands | | | | |
| | Floodplains | | | | | | Floodplains | | | | | | Floodplains | | | | |
| | Potential Wildfire Hazard | | | | | | Potential Wildfire Hazard | | | | | | Potential Wildfire Hazard | | | | |
| | Soil Erosion | | | | | | Soil Erosion | | | | | | Soil Erosion | | | | |
| | Water Quality | | | | | | Water Quality | | | | | | Water Quality | | | | |
| | Ground Water Recharge Area | | | | | | Ground Water Recharge Area | | | | | | Ground Water Recharge Area | | | | |
| | Air Quality | | | | | | Air Quality | | | | | | Air Quality | | | | |
| | Noise | | | | | | Noise | | | | | | Noise | | | | |
| | Radioactivity | | | | | | Radioactivity | | | | | | Radioactivity | | | | |
| | Electromagnetic Radiation | | | | | | Electromagnetic Radiation | | | | | | Electromagnetic Radiation | | | | |
| | Non-NASA Federal/State Lands | | | | | | Non-NASA Federal/State Lands | | | | | | Non-NASA Federal/State Lands | | | | |
| Biological Factors | Vegetation | | | | | Biological Factors | Vegetation | | | | | Biological Factors | Vegetation | | | | |
| | Wildlife Populations | | | | | | Wildlife Populations | | | | | | Wildlife Populations | | | | |
| | Wildlife Habitat | | | | | | Wildlife Habitat | | | | | | Wildlife Habitat | | | | |
| | Marine Finfish/Shellfish | | | | | | Marine Finfish/Shellfish | | | | | | Marine Finfish/Shellfish | | | | |
| | Threatened/Endangered Species | | | | | | Threatened/Endangered Species | | | | | | Threatened/Endangered Species | | | | |
| Socioeconomic Factors | Cultural Resources | | | | | Socioeconomic Factors | Cultural Resources | | | | | Socioeconomic Factors | Cultural Resources | | | | |
| | Economic Base | | | | | | Economic Base | | | | | | Economic Base | | | | |
| | Employment/Unemployment | | | | | | Employment/Unemployment | | | | | | Employment/Unemployment | | | | |
| | Housing | | | | | | Housing | | | | | | Housing | | | | |
| | Land Use/Prime Farmland | | | | | | Land Use/Prime Farmland | | | | | | Land Use/Prime Farmland | | | | |
| | Population Demographics | | | | | | Population Demographics | | | | | | Population Demographics | | | | |
| Infrastructure | Social Institutions | | | | | Infrastructure | Social Institutions | | | | | Infrastructure | Social Institutions | | | | |
| | Roads/Traffic | | | | | | Roads/Traffic | | | | | | Roads/Traffic | | | | |
| | Utility Corridors/Distribution | | | | | | Utility Corridors/Distribution | | | | | | Utility Corridors/Distribution | | | | |
| | Water Collection/Storage/Use | | | | | | Water Collection/Storage/Use | | | | | | Water Collection/Storage/Use | | | | |
| | Communications Systems | | | | | | Communications Systems | | | | | | Communications Systems | | | | |
| | Solid Waste Collection/Disposal | | | | | | Solid Waste Collection/Disposal | | | | | | Solid Waste Collection/Disposal | | | | |
| | Sanitary Waste Collection/Disposal | | | | | | Sanitary Waste Collection/Disposal | | | | | | Sanitary Waste Collection/Disposal | | | | |
| | Hazardous Materials Storage | | | | | | Hazardous Materials Storage | | | | | | Hazardous Materials Storage | | | | |
| Hazardous Waste Storage/Disposal | | | | | Hazardous Waste Storage/Disposal | | | | | Hazardous Waste Storage/Disposal | | | | | | | |
| Section IV: Remarks | | | | | | | | | | | | | | | | | |
| 13. NEPA Program Manager | | | | | | | | 14. Signature | | | | | 15. Date | | | | |

Appendix B

Maximum Weight Limitations on Wallops Causeway Bridge

H.26 Bridge Load Limit

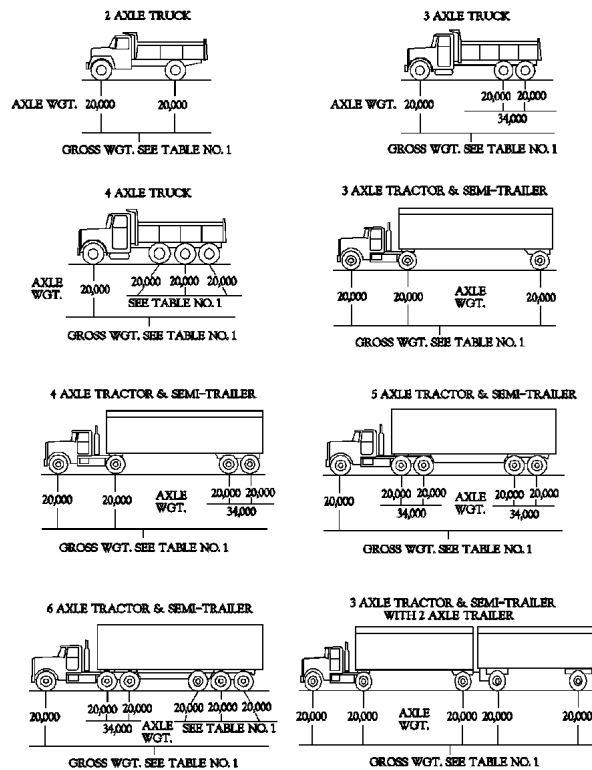
The Cat Creek Bridge on the access causeway to Wallops Island has design weight limits that are in most cases consistent with the Commonwealth of Virginia State Highway gross weight limits.

MAXIMUM WEIGHT LIMITATIONS ON CAUSEWAY BRIDGE

No two or more consecutive axles shall carry a weight in pounds in excess of the values given in Table 10-1 corresponding to the distance in feet between the extreme axles of the group, measured longitudinally to the nearest foot. The gross weights shown below are the maximum allowed.

| | |
|--|-----------------|
| ANY ONE AXLE..... | 20,000 POUNDS |
| TANDEM AXLE (more than 40 inches but not more than 96-inch spacing between axle center)..... | 34,000 POUNDS |
| SINGLE UNIT (2 AXLE)..... | 40,000 POUNDS |
| SINGLE UNIT (3 AXLE)..... | 54,000 POUNDS |
| SINGLE UNIT (4 AXLE)..... | SEE TABLE NO. 1 |
| TRACTOR-SEMITRAILER (3 AXLE)..... | 60,000 POUNDS |
| TRACTOR-SEMITRAILER (4 AXLE)..... | 74,000 POUNDS |
| TRACTOR-SEMITRAILER (5 AXLE)..... | 76,000 POUNDS |
| TRACTOR-SEMITRAILER (6 AXLE)..... | 76,000 POUNDS |

NOTE: The above listed weights are the maximum allowed and no vehicles shall travel on the bridge with a single axle weight in excess of 20,000 pounds, tandem axle weight in excess of 34,000 pounds, or a gross weight in excess of 76,000 pounds.



IFB5-12345/617 SECTION H

SPECIAL CONTRACT REQUIREMENTS

The total gross weight imposed upon the bridge by a vehicle shall not exceed the maximum weight given for the respective distance between the first and last axle of the group of axles measured longitudinally to the nearest foot in the following table.

Table 8-2 Weight Limitations on Bridge

| Distance in Feet Between the Extremes of any Two Axles | Maximum Weight in Pounds Between the Extremes of any Two or More Consecutive Axles | | | |
|---|---|---------|---------|-----------|
| | 2 Axles | 3 Axles | 4 Axles | 5&6 Axles |
| 4 | 34,000 | | | |
| 5 | 34,000 | | | |
| 6 | 34,000 | | | |
| 7 | 34,000 | | | |
| 8 | 34,000 | 34,000 | | |

Table 8-2 Weight Limitations on Bridge (Continued)

| Distance in Feet Between the Extremes of any Two Axles | Maximum Weight in Pounds Between the Extremes of any Two or More Consecutive Axles | | | |
|---|---|----------------|----------------|----------------------|
| | 2 Axles | 3 Axles | 4 Axles | 5&6 Axles |
| 9 | 39,000 | 42,500 | | |
| 10 | 40,000 | 43,500 | | |
| 11 | 40,000 | 44,000 | | |
| 12 | 40,000 | 45,000 | 50,000 | |
| 13 | 40,000 | 45,500 | 50,500 | |
| 14 | 40,000 | 46,500 | 51,500 | |
| 15 | 40,000 | 47,000 | 52,000 | |
| 16 | 40,000 | 48,000 | 52,500 | 58,000 |
| 17 | 40,000 | 48,500 | 53,500 | 58,500 |
| 18 | 40,000 | 49,500 | 54,000 | 59,000 |
| 19 | 40,000 | 50,000 | 54,500 | 60,000 |
| 20 | 40,000 | 51,000 | 55,500 | 60,500 |
| 21 | 40,000 | 51,500 | 56,000 | 61,000 |
| 22 | 40,000 | 52,500 | 56,500 | 61,500 |
| 23 | 40,000 | 53,000 | 57,500 | 62,500 |
| 24 | 40,000 | 54,000 | 58,000 | 63,000 |
| 25 | 40,000 | 54,500 | 58,500 | 63,500 |
| 26 | 40,000 | 55,500 | 59,500 | 64,000 |
| 27 | 40,000 | 56,000 | 60,000 | 65,000 |
| 28 | 40,000 | 57,000 | 60,500 | 65,500 |
| 29 | 40,000 | 57,500 | 62,000 | 66,000 |
| 30 | 40,000 | 58,500 | 62,000 | 66,500 |
| 31 | 40,000 | 59,000 | 62,500 | 67,500 |
| 32 | 40,000 | 60,000 | 63,500 | 68,000 |
| 33 | 40,000 | 60,000 | 64,000 | 68,500 |
| 34 | 40,000 | 60,000 | 64,500 | 69,000 |
| 35 | 40,000 | 60,000 | 65,500 | 70,000 |

Table 8-2 Weight Limitations on Bridge (Continued)

| Distance in Feet Between the Extremes of any Two Axles | Maximum Weight in Pounds Between the Extremes of any Two or More Consecutive Axles | | | |
|---|---|----------------|----------------|----------------------|
| | 2 Axles | 3 Axles | 4 Axles | 5&6 Axles |
| 36 | 40,000 | 60,000 | 66,000 | 70,500 |
| 37 | 40,000 | 60,000 | 66,500 | 71,000 |
| 38 | 40,000 | 60,000 | 67,500 | 72,000 |
| 39 | 40,000 | 60,000 | 68,000 | 72,500 |
| 40 | 40,000 | 60,000 | 68,500 | 73,000 |
| 41 | 40,000 | 60,000 | 69,500 | 73,500 |
| 42 | 40,000 | 60,000 | 70,000 | 74,000 |
| 43 | 40,000 | 60,000 | 70,500 | 75,000 |
| 44 | 40,000 | 60,000 | 71,500 | 75,500 |
| 45 | 40,000 | 60,000 | 72,000 | 76,000 |
| 46 | 40,000 | 60,000 | 72,500 | 76,000 |
| 47 | 40,000 | 60,000 | 73,500 | 76,000 |
| 48 | 40,000 | 60,000 | 74,000 | 76,000 |
| 49 | 40,000 | 60,000 | 74,500 | 76,000 |
| 50 | 40,000 | 60,000 | 75,500 | 76,000 |
| 51 | 40,000 | 60,000 | 76,000 | 76,000 |

Any vehicle desiring to cross the Cat Creek Bridge may be stopped and prohibited from crossing if the security guards or the Contracting Officer's Technical Representative (COTR) have reason to believe that the bridge limits may be exceeded. Verification of acceptable vehicle weights can be satisfied by:

- 1) Being escorted by the COTR to and crossing the Commonwealth of Virginia State Scales at New Church, Virginia, or
- 2) Demonstrating the actual weight by use of portable scales, or
- 3) Providing vehicle weight slips from a state certified scale which can be reasonably correlated to the load on the vehicle in question.

Special one time arrangements may be requested for loads which cannot meet the above limit or for vehicles that do not fall into one of the indicated categories. Prior arrangements must be requested 10 work days in advance by providing to the Contracting Officer the following information:

- 1) Rationale as to why the load cannot be subdivided to meet the bridge design limits.
- 2) Axles spacing and loads per axle.

The Government will require 5 working days to provide a response either permitting or denying permission allowing an overweight vehicle to cross the Cat Creek Bridge, Wallops Island, Causeway.

Appendix C

Correspondence



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219

Mailing address: P.O. Box 10009, Richmond, Virginia 23240

Fax (804) 698-4500 TDD (804) 698-4021

<http://www.deq.state.va.us>

George Allen
Governor

Becky Norton Dunlop
Secretary of Natural Resources

Thomas L. Hopkins
Director

(804) 698-4000
1-800-592-5482

August 27, 1996

Dr. Billie M. Reed, Executive Director
Virginia Commercial Space Flight Authority
Department of Engineering Management
Old Dominion University
Norfolk, Virginia 23529-0248

RE: Federal Consistency Determination for Construction of a New Launch Pad at Wallops
Flight Facility, Wallops Island, Virginia.

Dear Dr. Reed:

The Department of Environmental Quality has reviewed your August 26 letter requesting information on federal consistency determination requirements. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents and responding to appropriate federal officials on behalf of the Commonwealth. As discussed, pursuant to the Coastal Zone Management Act of 1972, as amended, federal actions, federally-funded projects, and projects requiring federal licenses and permits located within Virginia's designated coastal resource management area must be constructed and operated in a manner which is consistent with the Virginia Coastal Resources Management Program (VCRMP).

Accordingly, the proposed construction of a new launching pad and access road at NASA's Wallops Flight Facility must comply with the requirements of the VCRMP since the project will receive federal funds from the U.S. Department of Commerce, Economic Development Administration (EDA). In addition, the proposed action may require a permit from the U.S. Army Corps of Engineers. In Virginia, the coastal program incorporates several State permits, regulations, and policies as the enforceable programs of the VCRMP. In order to be consistent with the VCRMP, NASA (or VCSFA) must receive all the applicable permits and approvals listed under the Enforceable Programs of the VCRMP (Attachment 1) prior to commencing this project.

An Agency of the Natural Resources Secretariat

Dr. Billie M. Reed
Page 2

The Commonwealth believes that this proposal is consistent with the VCRMP provided NASA (or VCSFA) obtains all applicable State permits and approvals and the facility is constructed and operated in strict accordance with these programs. We look forward to reviewing the Environmental Assessment for this undertaking. Please feel free to call me at (804) 698-4325 if you need clarification of these comments or further assistance. We appreciate your interest in complying with the Coastal Zone Management Act.

Thank you for the opportunity to review this proposal.

Sincerely,

A handwritten signature in black ink, appearing to read "Ellie Irons", with a stylized flourish extending to the right.

Ellie Irons
Environmental Impact Review Coordinator

Enclosures

Attachment 1

**COMMONWEALTH of VIRGINIA****DEPARTMENT OF ENVIRONMENTAL QUALITY**George Allen
GovernorStreet address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
<http://www.deq.state.va.us>Thomas L. Hopkins
DirectorBecky Norton Dunlop
Secretary of Natural Resources(804) 698-4000
1-800-592-5482**Enforceable Regulatory Programs comprising Virginia's Coastal Resources Management Program**

- a. **Fisheries Management** - The program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. This program is administered by the Marine Resources Commission (Virginia Code §28.2-200 to §28.2-713) and the Department of Game and Inland Fisheries (Virginia Code §29.1-100 to §29.1-570).

The State Tributyltin (TBT) Regulatory Program has been added to the Fisheries Management program. The General Assembly amended the Virginia Pesticide Use and Application Act as it related to the possession, sale, or use of marine antifoulant paints containing TBT. The use of TBT in boat paint constitutes a serious threat to important marine animal species. The TBT program monitors boating activities and boat painting activities to ensure compliance with TBT regulations promulgated pursuant to the amendment. The MRC, DGIF, and VDACS share enforcement responsibilities (Virginia Code §3.1-249.59 to §3.1-249.62).

- b. **Subaqueous Lands Management** - The management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the Department of Environmental Quality, Water Division. The program is administered by the Marine Resources Commission (Virginia Code §28.2-1200 to §28.2-1213).
- c. **Wetlands Management** - The purpose of the wetlands management program is to preserve tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation. This program is administered by the Marine Resources Commission (Virginia Code §62.1-1301 through §62.1-1320).
- d. **Dunes Management** - Dune protection is carried out pursuant to The Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the Marine Resources Commission (Virginia Code §62.1-1400 through §62.1-1420).

An Agency of the Natural Resources Secretariat

Attachment 1

- e. Non-point Source Pollution Control - Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. This program is administered by the Department of Conservation and Recreation (Virginia Code §10.1-560 et.seq.).
- f. Point Source Pollution Control - The point source program is administered by the State Water Control Board pursuant to Virginia Code §62.1-44.15. Point source pollution control is accomplished through the implementation of:
 - (i) The National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to Section 402 of the federal Clean Water Act and administered in Virginia as the VPDES permit program.
 - (ii) Water Quality Certification pursuant to Section 401 of the Clean Water Act.
- g. Shoreline Sanitation - The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. This program is administered by the Department of Health (Virginia Code §32.1-164 through §32.1-165).
- h. Air Pollution Control - The program implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. This program is administered by the State Air Pollution Control Board (Virginia Code §10-1.1300).



COMMONWEALTH of VIRGINIA

H. Alexander Wise, Jr., Director

Department of Historic Resources

221 Governor Street
Richmond, Virginia 23219

August 27, 1996

Mr. Billie Reed
Executive Director
Commercial Space Flight Authority
Department of Engineering Management
Old Dominion University
Norfolk, VA 23529-0248

Re: EDA Application for Enhanced Multi-User Space Launch Facility
NASA Wallops Island Facility
Accomack County

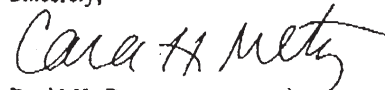
Dear Mr. Reed:

Thank you for meeting with Cara Metz of our staff on August 27, 1996 to discuss the referenced project. A review of our cultural resource inventory files indicates that no archaeological sites or historic structures are present in the immediate area of the proposed launch pad. One archaeological site, 44AC159, is adjacent to the project area.

We understand that additional information concerning this project will become available in the near future, and we will reserve comment until that time. We look forward to working with you further on this project.

Please contact Cara Metz at (804) 786-4517 if you have any questions or if we can be of further assistance.

Sincerely,


for David H. Dutton
Director, Division of Project Review

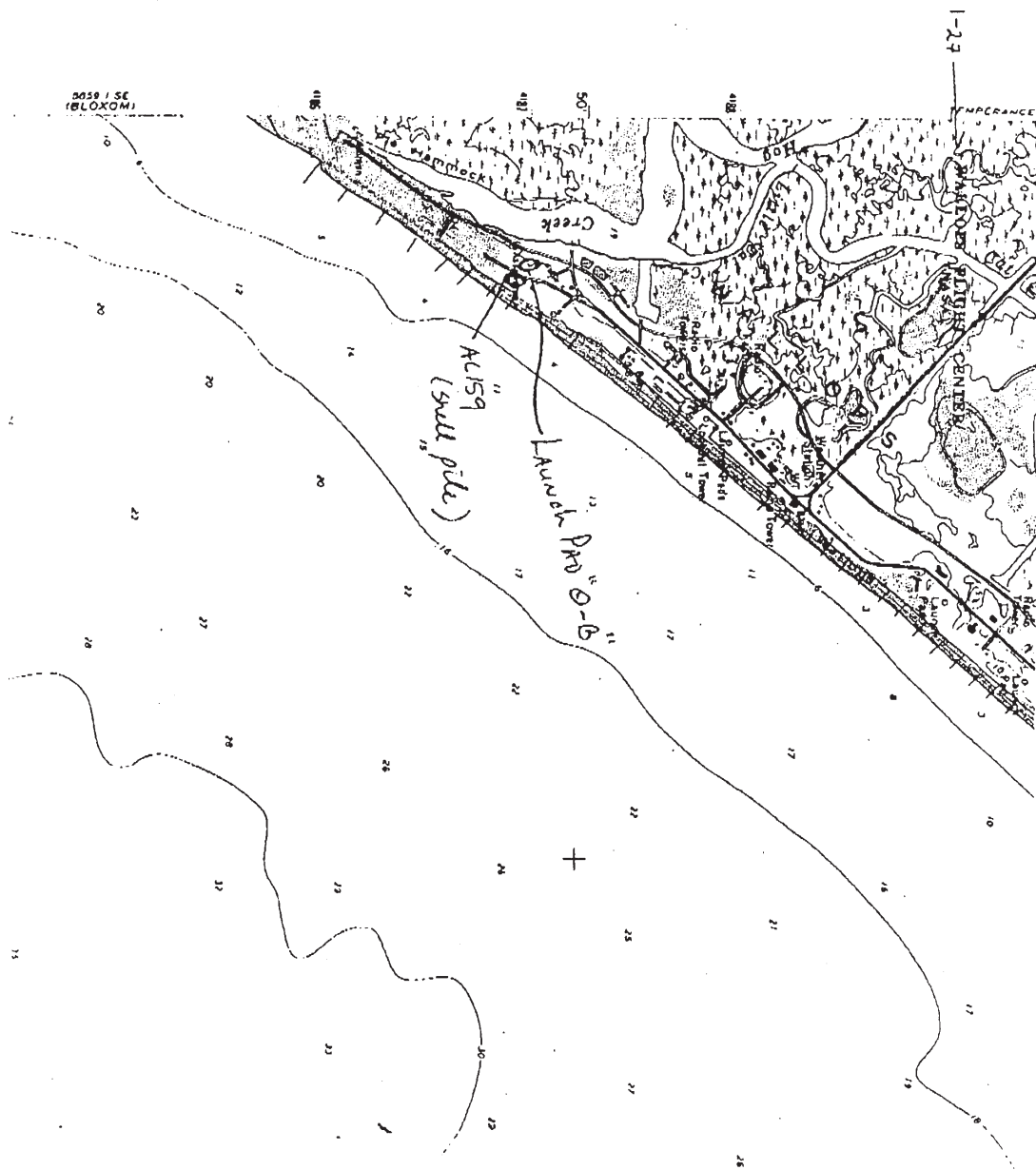
TELEPHONE: (804) 786-3143 TDD: (804) 786-1934 FAX: (804) 225-4261

An Equal Opportunity Agency

DEC 17 '96 14:10

804 683 5640

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DEC 17 '96 14:11

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** TOTAL PAGE.03 **

Appendix D

WFF Meteorological Conditions

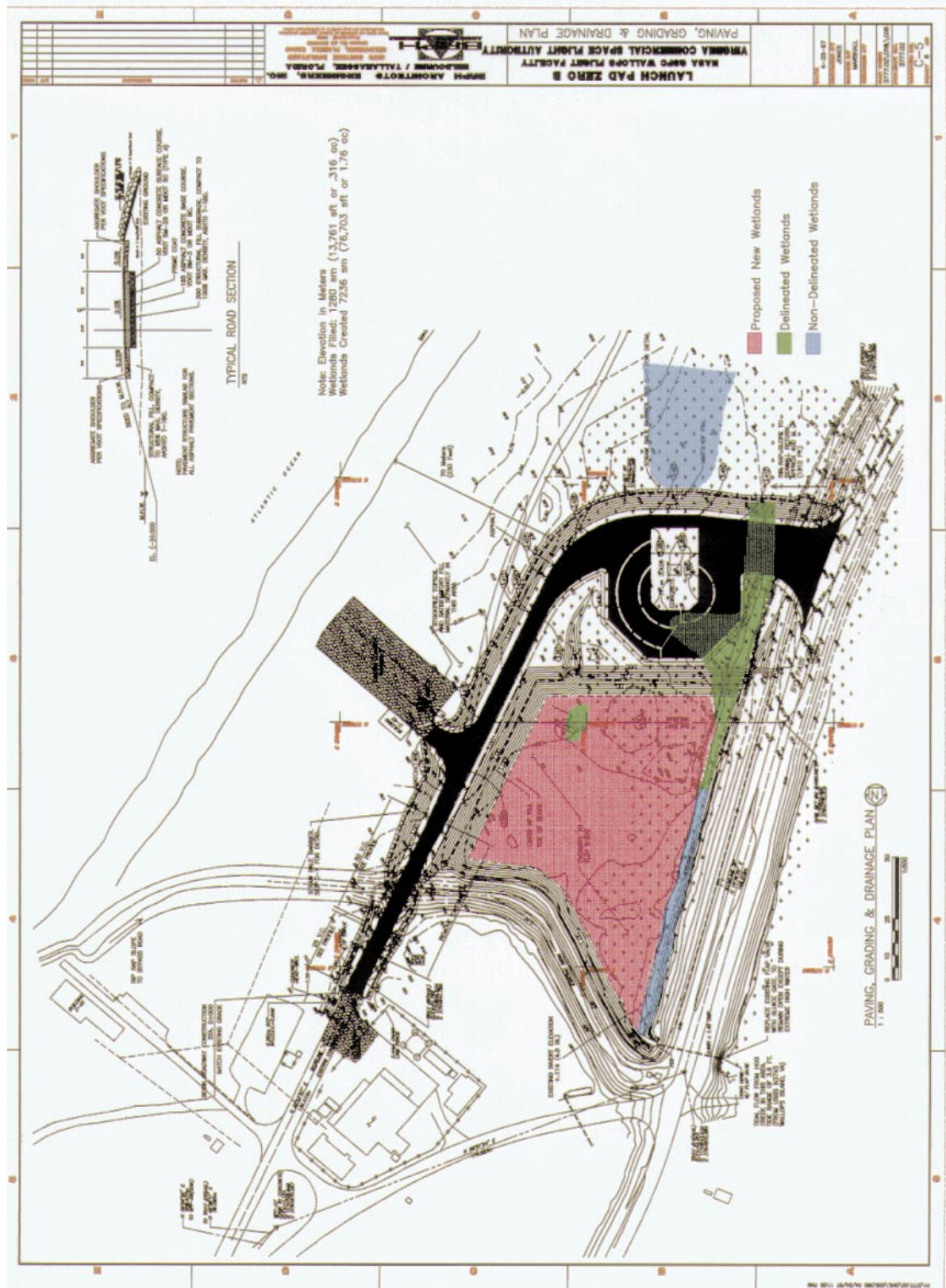
Sea Breeze: The predominant meteorological condition for WFF which lasts from late spring into early fall. Sea Breezes are conditions occurring in the absence of strong frontal systems. Wind direction is affected by land and sea temperature changes. As land temperature increases more rapidly than water temperature, the air mass over land rises, causing the cooler air mass over the water to move towards land. This creates **easterly** winds in the morning and lasts till late afternoon. In the evening, the opposite condition occurs as land cools faster than water, creating **westerly** winds.

Spring: Strong frontal systems dominate the weather patterns. Warming regional temperatures begin to push the strong frontal systems north of WFF, and create a predominately **southwesterly** wind pattern.

Fall: Strong frontal systems dominate the weather patterns. Cooler regional temperatures allow strong frontal systems from the North to push down to this region and create a predominately **northwesterly** wind pattern.

Appendix E

Wetlands Survey



Appendix F

Use Agreement

REIMBURSABLE SPACE ACT AGREEMENT

BETWEEN

THE UNITED STATES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AND

THE VIRGINIA COMMERCIAL SPACE FLIGHT AUTHORITY

FOR SUPPORT TO THE DEVELOPMENT AND OPERATION

OF A COMMERCIAL SPACEPORT AT THE GODDARD SPACE FLIGHT CENTER

WALLOPS FLIGHT FACILITY, WALLOPS ISLAND VIRGINIA

February 18, 1997

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ARTICLE I - SCOPE

The National Aeronautics and Space Administration by virtue of the National Aeronautics and Space Act of 1958, is directed to conduct its activities so as to contribute to the preservation of the role of the United States as a leader in aeronautical and space science and technology and their applications. In addition, the Act charges NASA with the responsibility "to provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

NASA is committed to encouraging a viable commercial U.S. space transportation industry. NASA goals include providing stable and predictable U.S. commercial sector access to appropriate NASA space-related hardware, facilities, and data on a reimbursable basis. NASA is directed to price the use of its property and services so as to encourage, but not directly subsidize, private sector commercial uses of ELVs, in accordance with national space policy and Chapter 701 of Title 49, United States Code.

NASA and the Virginia Commercial Space Flight Authority (hereinafter referred to as VCSFA), of Norfolk, VA, enter into this commercial space launch support agreement, (hereinafter referred to as the Agreement), to facilitate the development and long term operation of a commercial space flight center at the Goddard Space Flight Center (GSFC), Wallops Flight Facility (WFF) at Wallops Island, Virginia, and to provide launch range operational support on a case-by-case basis to the various VCSFA-sponsored user activities. NASA, pursuant to its mission and goals, agrees to provide reimbursable support to VCSFA for its Commercial Space Flight Center activities, on a noninterference basis, as determined by NASA. This Agreement establishes the general understandings between NASA and the VCSFA. Specific provision of Government property and services made available by NASA to support the VCSFA's Commercial Space Flight Center program will be accomplished through the execution of subagreements to include one covering access and use of the WFF facility and launch range support between the VCSFA and the GSFC. The launch range support subagreement shall provide the basis upon which the VCSFA may be granted such NASA assistance, services, and facilities as may be available to support the VCSFA-sponsored users, on a mission-by-mission basis. All subagreements are subject to the governing terms and conditions of this Agreement.

VCSFA:

The VCSFA is a subdivision of the Commonwealth of Virginia, codified at Sections 9-266.1 et seq., Code of Virginia. Its legal purposes are:

- To disseminate knowledge pertaining to scientific and technological research and development among private and public entities, including but not limited to knowledge in the area of commercial space flight.
- To promote industrial and economic development.

The VCSFA has adopted a mission in keeping with its legal purpose, with regard to a Commonwealth of Virginia Commercial Space Flight Center at Wallops Island. The mission objectives are:

- To develop and enhance infrastructure that facilitates timely, efficient, safe and low-cost access to space.
- To provide education and research in aerospace technologies and processes.
- To preserve, as a national asset, the expertise and capability for launch operations resident at the NASA Wallops Flight Facility.
- To stimulate aerospace-related economic activity in the region.

ARTICLE II - AUTHORITY

This nonexclusive reimbursable Agreement is entered into by VCSFA, with offices in Old Dominion University, Engineering Management Department, Norfolk, VA, and with the National Aeronautics and Space Administration Headquarters located at Washington, D.C. ("NASA"). The legal authority for NASA to enter into this Agreement is found in section 203(c) of the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. § 2473 (c)).

ARTICLE III - RESPONSIBILITIES

1. VCSFA Responsibilities. VCSFA shall undertake the following activities:

- a. Comply with all terms and provisions of this Agreement, including negotiation of requisite appendices for either modification of an existing facility or construction of a new facility, and any subagreement as signed.
- b. Obtain the necessary U.S. Government licenses, clearances, etc., required to operate the VCSFA Commercial Space Flight Center and comply with all applicable Federal, State, and local laws and regulations, to include all security and export laws and regulations.
- c. Prior to beginning construction, an Environmental Assessment (EA), or if necessary, an Environmental Impact Statement (EIS), will be prepared at the expense of VCSFA. In the case of an EIS, NASA shall select the environmental contractor who will prepare that document. NASA shall provide guidance and direction as appropriate, in the preparation and development of the EA or EIS, and independently evaluate the adequacy and accuracy of the EA and EIS.
- d. Submit, on a case-by-case basis, a request for support, identifying to the GSFC installation, in accordance with this Agreement, the Government property and services under the jurisdiction of NASA required to meet launch schedules and other particular operational requirements.
- e. Negotiate and execute subagreements with the GSFC as required so that available Government equipment, services, and support may be provided by NASA.
- f. Comply with all laws, requirements and regulations applicable to VCSFA and/or its activities on Government-owned property made available to VCSFA by NASA whether issued by a NASA field installation or other Government authorities. In

- the event VCSFA believes there is a conflict between requirements or regulations, VCSFA shall bring such inconsistency to the attention of the Director of GSFC.
- g. Comply with all required U.S. Government safety criteria including, but not limited to, the Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and NASA GSFC ground and flight safety regulations, or approved safety equivalency reports, as appropriate.
 - h. On an annual basis, provide both long-range and short-range projections of any activities anticipated within the scope of this Agreement including, to the extent possible, the anticipated support requirements for each mission.
 - i. Reimburse NASA for use of Government property and services pursuant to Article V, "Financial Arrangements."
 - j. VCSFA shall maintain a record keeping system that identifies and accounts for all Government property made available by NASA pursuant to this Agreement. This record keeping system will be auditable by the Government and will provide sufficiently detailed information to properly identify and account for all resulting direct costs incurred by the Government in accordance with the Commercial Space Launch Act, as amended. VCSFA's method of accounting for these direct costs will be mutually agreed to as part of the subagreements.

2. NASA GSFC Responsibilities. The following responsibilities assume that the property and services specified in the subagreement are available on a noninterference basis with NASA and other Government-sponsored activities. For purposes of this Agreement, the term "interference" means any VCSFA activity that impedes, disrupts, or delays the fulfillment of Government programmatic objectives including commitments to provide support to other users. Nothing in this Agreement commits NASA to maintain facilities or equipment beyond that needed to meet government requirements:

- a. Comply with all terms and provisions of this Agreement and any subagreement as signed.
- b. Negotiate and execute subagreements with VCSFA for the use of available Government property and services under the jurisdiction of NASA.
- c. Price the use of property and services consistent with law and NASA policy.
- d. Maintain, through the GSFC/WFF, any necessary support interface with VCSFA.
- e. Subject to the provisions of this Agreement and subagreements, timely furnish to VCSFA the property and services specified in any subagreements.

ARTICLE IV - USE OF GOVERNMENT-OWNED PROPERTY AND SERVICES

1. All references in this Agreement to Government property and services made available to VCSFA relate solely to property and services made available by NASA to VCSFA or VCSFA's subcontractors for the purposes of supporting VCSFA's commercial space flight center program in accordance with law. Reimbursement will be in accordance with law and NASA policy. Any goods and/or services involving launch property of the U.S. that is excess or otherwise not needed for public use will be billed based on direct costs as defined in U.S.C. Title 49, Subtitle IX, Paragraph 70111(b). Property and services, to be determined by mutual agreement of the

Parties, are made available on a noninterference, as-is, shared-use basis, at their given location. However, mobile hardware, civil service and agency contractor personnel may be made available for a limited time at approved non-NASA sites in the Continental United States on a noninterference basis. In such case, the direct cost to be reimbursed by VCSFA includes equipment shipping, and transportation, insurance, and other unique costs for the time the equipment is dedicated to the exclusive use of the VCSFA. At no time will VCSFA be provided NASA property and/or services on an unrestricted exclusive use basis.

2. It is U.S. Government policy to seek and encourage the maximum commercial use of space, including commercial activities related to U.S. ELV launches. Consistent with that policy, NASA will not compete with viable, domestic commercial firms in the provision of Government owned property or services for non-U.S. Government missions. Therefore, as a prerequisite to obtaining direct use of Government-owned property or services made available to VCSFA by NASA under this Agreement, VCSFA shall provide a written verification to the best of VCSFA's knowledge to the appropriate NASA field center that no viable United States domestic firm exists to provide comparable property or services, or if such a firm exists, there are circumstances which preclude the use of this domestic firm for the required property or services. NASA will evaluate the verification and respond in a timely manner.

3. NASA shall have the authority to require that any activity of VCSFA conducted pursuant to this Agreement which interferes with other activities at any Government-owned facility made available to VCSFA by NASA, or which poses an imminent hazard to property or person(s) be promptly ended or corrected by VCSFA. Government property made available to VCSFA by NASA pursuant to this Agreement will be operated by NASA personnel, including NASA contractor personnel, except as determined in any subagreements.

4. VCSFA shall be subject to NASA written policies with respect to access to and use of Government property and services made available to VCSFA by NASA or NASA contractor property to the extent not expressly and specifically addressed in this Agreement. With respect to those written policies and changes thereto that have not been published or otherwise made available, NASA shall provide VCSFA a reasonable opportunity to become familiar and comply with those policies and all changes thereto.

ARTICLE V - FINANCIAL ARRANGEMENTS

1. NASA shall be reimbursed by VCSFA in connection with the use of Government property and services provided to VCSFA by NASA under this Agreement. Requests from VCSFA to NASA for support may be in the form of yearly (level of effort) support or individual mission or individual project related support. NASA will provide to VCSFA a cost estimate for the support requested by VCSFA and for any other services that are deemed necessary by NASA.

2. VCSFA must recognize that projected cost information is only an estimate. Charges for goods and services which involve launch property of the U.S. that is excess or otherwise not needed for public use will be based on all direct cost incurred by the Government. Other goods

and services will be billed consistent with law and NASA policy. Cost estimates for the use of property and/or services and payment schedules shall be established under subagreement or subagreement annexes between VCSFA and GSFC, and shall be consistent with law and NASA policy, including the requirement for payment in advance of the incurrence of costs. Payment schedules for either yearly support activities or individual project or individual mission support activities shall include an initial payment of not less than 10 percent of the total estimated cost.

3. Nothing in this Agreement waives VCSFA's obligation to reimburse the Government in accordance with the terms of other agreements or contracts with the Government which provide for VCSFA's use, or any of VCSFA's contractors' use, of the same Government property or services utilized by VCSFA or its subcontractors pursuant to this Agreement.

4. Advance payments shall be scheduled to keep pace with the rate at which NASA anticipates incurring costs. Both the overall cost and the payment schedule shall be mutually agreed to prior to the use of Government property and services. Prompt payment is the essence of this Agreement. If VCSFA fails to make payment by the payment due date, NASA may terminate this Agreement for VCSFA's breach of this Agreement after notice to VCSFA of the breach and VCSFA's failure to cure such breach within a mutually agreed to period of time. Although payment must be rendered according to the terms of the previously arranged schedule and status reports as provided, a disagreement over the amount or other aspects of a particular notice is subject to the disputes resolution procedure outlined in Article XI, "Disputes."

5. All payments defined in this Agreement shall be in accordance with the following:

- (i) Payment shall be in United States dollars.
- (ii) Payment shall be payable to the National Aeronautics and Space Administration.
- (iii) Payment shall be sent to the Director, Financial Management Division (Code 150), NASA Goddard Space Flight Center, Greenbelt, MD 20771.
- (iv) Payment shall be received at GSFC by the first U.S. Government working day which is also a day on which commercial banks are open for business in both New York, NY, and Washington, DC, in the month in which such payments are scheduled, unless otherwise explicitly stated herein, or directed or agreed to by GSFC in writing as an alternative to sending payments to GSFC as specified in (iii) above.

6. VCSFA may elect payment by wire transfer to the United States Treasury FEDWIRE Deposit System (FDS) in accordance with instructions available upon written request to the Director, Financial Management Division. All payments toward and other communications regarding this Agreement shall reference the title, date, and number of this Agreement.

7. NASA shall forward to VCSFA a financial status report on a periodic basis showing the status of payments received and costs incurred for services under this Agreement. Depending upon the level of activity, this can occur quarterly, semiannually, or annually. Each status report will be segregated by mission, payload, project or as otherwise requested by VCSFA and will identify the associated costs of each activity since the previous report. In addition, VCSFA may, upon request, receive from GSFC monthly reports of the preliminary status of charges at GSFC. If, as

a result of this status report, additional payment from VCSFA is required, prompt payment is required and the payment schedule must be adjusted accordingly. If an overpayment has occurred, credit will be reflected on the next status report under this Agreement.

8. NASA shall send a final status report to VCSFA identifying costs for services as soon as possible after the completion of the last service provided. The final status report will address any additional payment required and will address any refund due VCSFA.

9. If, as a result of the final status report, an additional payment from VCSFA is required, such payment shall be due 60 days after the date of the final status report. If, as a result of a final status report, a refund is due VCSFA, NASA will make such refund in the amount of the overpayment within 60 days after the date of the final status report.

ARTICLE VI - LIABILITY AND RISK OF LOSS

1. For purposes of this ARTICLE, the following definitions shall be applicable:

- a. "LIABILITY" shall include payments made pursuant to United States' treaty, any judgment by a court of competent jurisdiction, administrative and litigation costs, and settlement payments.
- b. "DAMAGE" shall mean bodily injury to, or other impairment of health of, or death of any person; damage to, loss of, or loss of use of any property; soil, surface water, ground water, or other environmental contamination or damage; loss of revenue or profits; other direct damages; or any indirect or consequential damage arising therefrom.

2. DAMAGE to Other Than the Government:

- a. VCSFA shall obtain or arrange to obtain, at no cost to NASA, insurance protecting the U.S. Government and U.S. Government contractors and subcontractors, from any LIABILITY for DAMAGE, arising out of the performance of this Agreement, including launch and associated activities, resulting in DAMAGE to:
 - (1) VCSFA's employees or agents, parties in privity with VCSFA, VCSFA's customers, or their contractors or subcontractors, and
 - (2) Third parties, including U.S. Government employees, and U.S. Government contractor and subcontractor employees.

Insurance required under Subparagraph 2a(1) above may be satisfied through a LIABILITY insurance policy or policies under Subparagraph 2a(2) above. Article XVII notwithstanding, upon obtaining the insurance required under Subparagraph 2a(1) above, or upon obtaining any modification or amendment thereof, VCSFA shall personally deliver, or send by registered or certified mail, postage prepaid, two copies of such insurance, or such

modification or amendment, to NASA at the following address, or at such address as NASA may from time to time designate in writing:

NASA Goddard Space Flight Center
Attn: Chief Counsel; Mail Code 140
Greenbelt, MD 20771

- b. VCSFA shall maintain insurance with terms and conditions as are currently available in the market for reasonable insurance premiums, taking into account renewals, but shall not be obligated to provide insurance limits in excess of \$500,000,000 coverage. VCSFA shall provide to NASA certificates of insurance evidencing the insurance required thereunder within a reasonable time before VCSFA begins to use Government property or Government services. Unless VCSFA provides evidence that such a condition in an insurance policy is not available at a reasonable premium, the insurance policy shall provide for the right of the U.S. Government to settle reasonably a claim after consultation with VCSFA and its insurance underwriters. Claims made exclusively against the VCSFA may only be settled or compromised in accordance with § 2.1-127, et seq. of the Code of Virginia.
- c. VCSFA is subject to the requirements of other U.S. Government agencies, specifically:
 - (1) To the extent the exercise of the Department of Transportation's (DOT) authority under the Commercial Space Launch Act as amended is applicable and inconsistent with an express requirement in Subparagraphs 2a., 2b., or Paragraph 3 of this Article, VCSFA shall maintain LIABILITY insurance in such amounts and under such terms and conditions as DOT shall specify.
 - (2) VCSFA is subject to applicable DOD requirements with respect to DOD ranges and other facilities.
- d. VCSFA's insurance obtained pursuant to Subparagraph 2a shall not be the exclusive recourse of the United States in the event LIABILITY exceeds the amount of coverage. The United States reserves the right to bring an action against any responsible party for LIABILITY incurred by the United States under domestic or international law.
- e. Each party agrees to cooperate with the other in obtaining any information, data, reports, contracts, and similar materials in connection with the presentation or defense of any claim by either party under any policy of insurance purchased to meet the requirements of this Article.
- f. VCSFA shall be subject to NASA written policies, upon receipt of reasonable notice of said policies, with respect to access to and use of Government property provided by NASA to VCSFA or NASA contractor or subcontractor property to the extent not expressly and specifically addressed in this Agreement.

3. Damage or Loss to Government Property:

- a. In addition to the insurance required in Subparagraph 2a above, within a reasonable time before VCSFA begins to have access to or use of U.S. Government property or services, VCSFA shall obtain or arrange to obtain, at no cost to NASA, insurance to reimburse the U.S. Government for the costs of replacing or repairing, or the fair market value of, as reasonably determined by the U.S. Government, any U.S. Government property (real or personal) which is provided under this Agreement, which property is DAMAGED as a result of any performance of this Agreement, including performance by the U.S. Government or the U.S. Government's contractors or subcontractors. Article XVII notwithstanding, upon obtaining the insurance required under this paragraph, or upon obtaining any modification or amendment thereof, VCSFA shall personally deliver, or send by registered or certified mail, postage prepaid, two copies of such insurance, or such modification or amendment, to NASA at the following address, or at such address as NASA may from time to time designate in writing:

NASA Goddard Space Flight Center
Attn: Chief Counsel; Mail Code 140
Greenbelt, MD 20771

- b. The United States shall waive any claim for property DAMAGE in excess of the monetary limits established for the insurance policy required in this Paragraph 3.
- c. In the event VCSFA is unable to obtain insurance coverage required by Subparagraph 3a above, the parties agree to consider, subject to review, approval and agreement by NASA, alternative methods of protecting U.S. Government property.
- d. An insurance policy whose terms and conditions are reviewed and approved by NASA, or an agreement on an alternative method of protection is a condition precedent to VCSFA's access to or use of U.S. Government property or U.S. Government services under this Agreement.
4. DAMAGE to VCSFA and its Related Entities: In order to assure that the U.S. Government is not exposed to any LIABILITY for Damage as a result of making facilities and services available under this agreement, VCSFA waives all claims against the U. S. Government and its related entities (contractors, subcontractors, other customers and other customers' contractors or subcontractors) for any DAMAGE arising under this Agreement. In addition, VCSFA agrees to require, by contract or otherwise, its related entities (contractors, subcontractors, customers, users, and contractors and subcontractors of customers and users) to waive all claims against the U.S. Government and the U.S. Government's related entities for DAMAGES arising as a result of activities of this agreement, whether or not the U.S. Government or its contractors or subcontractors are negligent. In addition, VCSFA shall

arrange to obtain insurance, acceptable in terms and amount to NASA, to cover claims for DAMAGE to VCSFA or its related entities.

5. The insurance required under Subparagraphs 2, 3, and 4 shall provide coverage in an amount acceptable to NASA. This policy shall name the United States as an insured and shall cover all risks of loss except that it may exclude DAMAGE caused by the U.S. Government's willful misconduct or reckless disregard. The insurance policy shall provide that the insurer waives its right as a subrogee against U.S. Government contractors or subcontractors for DAMAGE.
6. Limitation of U.S. Government and VCSFA Liability. To the extent that a risk of DAMAGE is not dealt with expressly in Paragraphs 2 through 4 of this Article, the U.S. Government's LIABILITY to VCSFA, and VCSFA's LIABILITY to the U.S. Government arising out of this Agreement, whether or not arising as a result of an alleged breach of this Agreement, shall be limited to direct DAMAGES only and shall not include any loss of revenue, profits, or other indirect or consequential DAMAGES. This limitation of LIABILITY shall not apply to indemnity for patent infringement claims as provided for in Paragraph 7 of this Article.
7. Patent Infringement Claim.

a. VCSFA shall obtain or arrange to obtain, at no cost to NASA, insurance protecting the Government and its officers, agents, and employees against LIABILITY, including costs, for infringement of privately-owned U.S. patents to the extent that any such LIABILITY arises out of the use of products, processes, or articles of manufacture used in connection with the furnishing of the facilities and services to VCSFA under provisions of this Agreement. VCSFA's contractors shall indemnify the Government and its officers, agents, and employees against LIABILITY, including costs, for infringement of privately-owned U.S. patents to the extent that any such LIABILITY arises out of the use of products, processes, or articles of manufacture used in connection with the furnishing of the facilities and services to VCSFA under provisions of this Agreement. Should infringement costs involve services for other parties, including the Government, VCSFA's share of the costs will be determined on a pro rata basis. The foregoing requirements shall not apply unless VCSFA and its insurance underwriters have been informed as soon as practicable by the Government of the suit or action alleging such infringement, and shall have been given such opportunity as is afforded by the applicable laws, rules, or regulations to participate in the defense thereof; and further, such indemnity shall not apply to claimed infringement that is settled without the consent of VCSFA and its insurance underwriters, unless required by final decree of a court of competent jurisdiction.

Article XVII notwithstanding, upon obtaining the insurance required under sub-paragraph 7a. above, or upon obtaining any modification or amendment thereof, VCSFA shall personally deliver, or send by registered or certified mail, postage prepaid, two copies of such insurance, or such modification or amendment, to NASA at the following address, or at such address as NASA may from time to time designate in writing:

NASA Goddard Space Flight Center
ATTN: Chief Counsel, Mail Code 140
Greenbelt, MD 20771

b. VCSFA shall maintain insurance with terms and conditions as are currently available in the market for reasonable insurance premiums, taking into account renewals, but shall not be obligated to provide insurance limits in excess of \$500,000,000 coverage. VCSFA shall provide to NASA certificates of insurance evidencing the insurance required thereunder within a reasonable time before VCSFA begins to use Government property or Government services. Unless VCSFA provides evidence that such a condition in an insurance policy is not available at a reasonable premium, the insurance policy shall provide for the right of the U.S. Government to settle reasonably a claim after consultation with VCSFA and its insurance underwriters. Claims made exclusively against the VCSFA may only be settled or compromised in accordance with § 2.1-127, et seq. of the Code of Virginia.

c. VCSFA's insurance obtained pursuant to sub-paragraph 7a shall not be the exclusive recourse of the United States in the event LIABILITY exceeds the amount of coverage. The United States reserves the right to bring an action against any responsible party for LIABILITY incurred by the United States under domestic or international law.

d. Each party agrees to cooperate with the other in obtaining any information, data, reports, contacts, and similar materials in connection with the presentation or defense of any claim by either party under any policy of insurance purchased to meet the requirements of this Article.

ARTICLE VII - INTELLECTUAL PROPERTY

A. Definitions

1. The term "Participant," as used herein, means any non-U.S. Government entity that is a party to this Agreement. The patent and invention rights and rights in data set forth herein are applicable to any employees, contractors or subcontractors, or other entities having a fiduciary or contractual relationship with Participant that are assigned, tasked, or contracted with to perform specified Participant activities under this Agreement.

2. The term "data," as used herein, means recorded information, regardless of form, the media on which it may be recorded, or the method of recording. The term includes, but is not limited to, data of a scientific or technical nature, computer software and documentation thereof, and data comprising commercial and financial information.

B. Patent and Invention Rights

1. General: Title to inventions made (conceived or first actually reduced to practice) as a consequence of, or in direct relation to, the performance of activities under this Agreement will remain with the respective inventing parties (Participant or NASA), and no patent or invention rights are exchanged between or granted by such parties under this Agreement except that, NASA and the Participant agree to use reasonable efforts to identify and report to each other any invention which is believed to have been made jointly by employees of the Participant and employees of NASA (including employees of NASA contractors), and to consult and agree as to the responsibilities and costs of actions to be taken to establish and maintain patent protection (in any country) on such invention and on the terms and conditions of any license or other rights to be exchanged or granted by or between NASA and the Participant.

C. Rights in Data

1. General: Data exchanged between NASA and Participant under this Agreement will be exchanged without restriction as to its disclosure, use, or duplication except as otherwise provided below in this provision.

2. Participant produced data: In the event it is necessary for Participant to furnish NASA with data which either existed prior to, was produced outside of, or is first produced by Participant in carrying out Participant's responsibilities under this Agreement, and provided such data embodies trade secrets or comprises commercial or financial information which is privileged or confidential and is so identified with a suitable notice or legend, the data will be maintained in confidence and disclosed and used by NASA and its contractors (under suitable protective conditions) only for the purpose of carrying out NASA's responsibilities under this Agreement. Upon completion of activities under this Agreement, such data will be disposed of as requested by Participant.

3. Data first produced by NASA: As to data first produced by NASA in carrying out NASA's responsibilities under this Agreement and which data would embody trade secrets or would comprise commercial or financial information that is privileged or confidential if obtained from Participant, such data will, upon timely and specific identification and request by Participant, and to the extent permitted by law, be maintained in confidence and disclosed and used by NASA and its contractors (under suitable protective conditions) only for the purpose of carrying out NASA's responsibilities under this Agreement. Upon completion of activities under this Agreement, such data will be disposed of as requested by Participant.

ARTICLE VIII - WARRANTY

NASA, by agreeing to provide information, goods, property and/or services to VCSFA, makes no warranties whatsoever with respect to the availability or suitability for any particular use of this information, goods or services. Such items are offered on an as-is basis.

ARTICLE IX - TERM

Except as otherwise provided in Article IX, "Termination", this Agreement will be effective for a period of 5 years from the date of Agreement execution, with five-5 year option periods to follow. Option years can be exercised by request of VCSFA and agreement by NASA, which agreement will not be unreasonably withheld. In considering VCSFA's request for exercising an option, NASA will take into account the Agency's current and future plans for facilities and services that would be impacted by the extension, the extent of VCSFA's commercial business including the amount of nonfederal funds invested, and other non-federal demands for the same NASA goods and/or services.

ARTICLE X - TERMINATION

1. NASA's commitment under this Agreement to make available Government property and services required by VCSFA may be terminated by NASA, in whole or in part, (a) upon a declaration of war by the Congress of the United States, or (b) upon a declaration of a national emergency by the President of the United States, or (c) upon VCSFA's failure to make payment as set forth in Article V, (d) upon VCSFA's failure to establish and maintain a viable spaceport business, or (e) upon a NASA determination, in writing, that NASA is required to terminate such services for reasons beyond its control. For purposes of this Article X, reasons beyond NASA's control are reasons which make impractical or impossible NASA's or its contractors' or subcontractors' performance of this Agreement. Such reasons include, but are not limited to, Acts of God or of the public enemy; acts of the U.S. Government other than NASA, in either its sovereign or contractual capacity (to include failure of Congress to appropriate sufficient funding); fires; floods; epidemics; quarantine restrictions; strikes; freight embargoes; or unusually severe weather.

2. In the event of termination for reasons given above, NASA will seek to provide reasonable advance notice and will seek to mitigate the effect of such termination, if possible, and will enter into discussions with VCSFA for that purpose. For the use of property and/or services provided for on a fixed-price basis, the costs incurred by the United States, including termination costs, shall not exceed the fixed price of the services which would have been provided had termination not taken place. For use of property and/or services provided on a cost basis, VCSFA shall be liable for all costs, consistent with law and NASA policy, which are incurred by the U.S. Government in the provision of property and/or services, including termination costs associated with the Agreement activities.

3. NASA shall not be liable for any costs, loss of profits, revenue, or other direct, indirect, or consequential damages incurred by VCSFA, its contractors, subcontractors, or customers as a result of the termination by NASA pursuant to Paragraph 1 of this Article.

4. VCSFA shall have the right to terminate, in whole or in part, this Agreement at any time. In the event of such termination, VCSFA shall be obligated to reimburse NASA for all Government costs which have been incurred up to the effective date of VCSFA's notice of termination and are incurred as a result of such termination.

5. This Article is not intended to limit or govern the right of NASA or VCSFA, in accordance with law, to terminate its performance under this Agreement, in whole or in part, for VCSFA's or NASA's breach of a provision in this Agreement.

ARTICLE XI - DISPUTES

1. Except as otherwise provided in Articles VII "Intellectual Property", and XII "Priority and Delay", all disputes concerning questions of fact or law arising under this Agreement shall be referred by the claimant in writing to the VCSFA Executive Director and the GSFC Director for resolution. The parties cited above shall seek to resolve any dispute by mutual agreement which shall be final and conclusive.

2. If the parties cited in Paragraph 1 are unable to agree on a resolution, the claimant may submit the dispute in writing to the NASA and VCSFA's signatories of this Agreement, who shall attempt to resolve the dispute by mutual agreement which shall be final and conclusive. Cognizant NASA institutional/program offices shall concur in the dispute resolution as appropriate.

3. Any dispute which is not resolved by mutual agreement of the NASA and VCSFA signatories of this Agreement, or their designees, within 60 days of both parties receiving written notice of the dispute, may be submitted in writing by the claimant to the NASA Administrator. At his discretion, the NASA Administrator may choose to delegate this decisional authority. In connection with any proceeding before the Administrator, or his authorized representative, under this paragraph, the claimant shall be offered an opportunity to be heard and to offer evidence in support of its complaint. The written decision of the Administrator, or his duly authorized representative, in the determination of such disputes shall be made within a reasonable period of time of the hearing and/or evidence provided by the claimant referred to in the prior sentence and shall be deemed to be a final agency decision for all purposes. Upon receipt of such final decision, VCSFA shall be free to pursue any remedy which may be available to it in any other court or forum as may be prescribed by law.

4. Pending resolution of any disputes pursuant to this Article, the parties agree that performance of all obligations shall be pursued diligently in accordance with the direction of the NASA signatory.

5. The parties agree that this disputes procedure shall be the exclusive procedure followed by the parties in resolving any dispute arising under, or based on, an express or implied provision of this Agreement, including an alleged breach.

6. If the subject of any dispute concerns any question of fact or law pertaining to liability or damage, as defined in Article VI, for soil, surface water, groundwater, or other environmental contamination or damage arising from activities under this Agreement, the procedure outlined in the preceding five paragraphs of this Article shall apply. In addition, NASA and VCSFA shall

apply those equitable principles they deem appropriate in determining the apportionment of such liability or damage, which principles shall include, but need not be limited to, the following:

- a. VCSFA shall not be responsible for liability for soil, surface water, groundwater, or other environmental contamination or damage which occurred prior to commencement of VCSFA's activities under this Agreement.
- b. VCSFA shall be responsible for liability for soil, surface water, groundwater, or other environmental contamination or damage caused by VCSFA's activities under this Agreement.

ARTICLE XII - PRIORITY AND DELAY

NASA will make good faith efforts to accord VCSFA a high degree of stability in the conduct of its Commercial Space Flight Center business. To that end:

1. VCSFA will coordinate with NASA as soon as practicable regarding its usage needs of Government property and services, made available to VCSFA by NASA pursuant to this Agreement, to meet specific VCSFA schedule and launch requirements in order to minimize the impact of Government launch activities on VCSFA's operations. However, the Government shall have priority in the use of Government property and services. If, after VCSFA has scheduled the use of Government property and services, NASA asserts its right of priority, NASA will consult with VCSFA in advance and will attempt to minimize scheduling impacts.
2. In the case of the use of Government property and services by non-governmental commercial users, NASA shall have the right to resolve scheduling conflicts, giving due regard to the cause(s) of the conflict, the sequence of the original schedule, as well as the impact of a scheduling change on the various users.
3. In the event that NASA exercises its right of scheduling priority for Government or commercial launch activity support, NASA will make reasonable effort to keep planned NASA support to VCSFA as close to the original schedule as possible. This effort may include, but does not obligate NASA to seek alternative Government property or services under the jurisdiction of NASA at the respective NASA field installation. Nothing in this paragraph alters other provisions of this Agreement.
4. The Associate Administrator for Mission to Planet Earth, or his designee, in consultation with cognizant NASA offices, shall determine the priority of users for Government property and services offered pursuant to this Agreement. The appropriate NASA institutional or program office shall concur in this determination. The decision of the Associate Administrator for Mission to Planet Earth, or his designee, shall be final and not subject to the provisions of Article XI, "Disputes."
5. Nothing in this Article shall constitute a modification or waiver of the rights and duties established by law, including the Commercial Space Launch Act.

ARTICLE XIII - APPLICABLE LAW

VCSFA and NASA hereby designate the United States Federal law to govern this Agreement for all purposes, including, but not limited to, determining the validity of this Agreement, the meaning of its provisions, and the rights, obligations, and remedies of the parties. To the extent Federal law does not cover the issues in controversy, substantive Virginia law shall pertain, but in no event does this provision subject NASA to the jurisdiction of the Virginia courts.

ARTICLE XIV - SERVICES CONSISTENT WITH UNITED STATES' OBLIGATIONS, LAWS, AND PUBLISHED POLICY

Government property or services made available by NASA for use by VCSFA under this Agreement are made available to the extent such use is consistent with United States' laws, policies, or obligations.

ARTICLE XV - ASSISTANCE WITH CLAIMS

VCSFA agrees that it will provide NASA with reasonable assistance in defense of any claims asserted against NASA arising from or in connection with the use of Government property or services provided by NASA to VCSFA under this Agreement. NASA agrees that it will provide VCSFA with reasonable assistance in defense of any claims asserted against VCSFA arising from or in connection with actions directly associated with NASA's provision of property or services under this Agreement.

ARTICLE XVI - ASSIGNMENT OF RIGHTS

VCSFA shall not assign to another person or entity this Agreement or any part of its rights under this Agreement, except as otherwise expressly agreed to by NASA, in writing, such agreement not to be unreasonably withheld, or if the assignment is made to a wholly-owned United States domestic subsidiary of VCSFA.

ARTICLE XVII - REVISION OF AGREEMENT

It is the intent of NASA and VCSFA to implement this Agreement in the form in which it is signed. However, the signatories of this Agreement or their designees may by mutual consent revise this Agreement. A revision to the Agreement does not in and of itself require consideration in order to take effect, but consideration may be a factor in a specific revision to the Agreement. Revisions shall be in writing and shall be subject to Article XIV, "Services Consistent with United States' Laws and Policy" of this Agreement.

ARTICLE XVIII - ANTI-DEFICIENCY ACT

All activities under or pursuant to this agreement are subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or provision of funds in violation of the Anti-Deficiency Act, 31 U.S.C. § 1341.

ARTICLE XIX - APPROVAL OF AGREEMENT

Executed at Washington, DC, by the parties on the dates noted:

W. F. Townsend
William F. Townsend
Acting Associate Administrator for
Mission to Planet Earth
National Aeronautics and Space Administration

2/26/97
(Date)

Wilbur C. Trafton
Wilbur C. Trafton
Associate Administrator for
Office of Space Flight
National Aeronautics and Space Administration

2/28/97
(Date)

Billie M. Reed
Dr. Billie M. Reed
Executive Director
VCSFA
Old Dominion University
Engineering Management Department
Norfolk, VA 23520-0248

3/4/97
(Date)

Appendix G

USFWS Section 7 Consultation

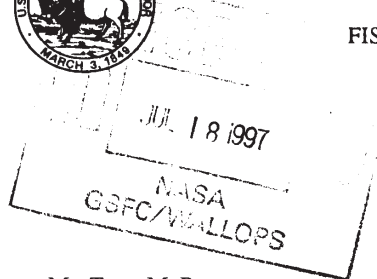


United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
P.O. Box 99
6669 Short Lane
Gloucester, Virginia 23061

July 14, 1997



Mr. Terry M. Potterton
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337-5099

Colonel Robert H. Reardon, Jr.
U.S. Army Corps of Engineers
803 Front Street
Norfolk, Virginia 23510-1096

Re: Range Operations Expansion at
Wallops Flight Facility, Accomack
County, Virginia

Gentlemen:

The U.S. Fish and Wildlife Service (Service) has reviewed the National Aeronautics and Space Administration's (NASA) proposal to expand range operations at Wallops Flight Facility, Accomack County, Virginia. NASA's April 22, 1997 request for formal consultation was received on April 22, 1997. This document represents the Service's biological opinion on the effects of that action on the piping plover (*Charadrius melodus*), federally listed threatened, in accordance with Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). A complete administrative record of this consultation is on file in this office.

I. CONSULTATION HISTORY

- | | |
|----------|--|
| 02-27-97 | The Service received a copy of the Environmental Assessment for Range Operations Expansion at the NASA Goddard Space Flight Center's Wallops Flight Facility with a cover letter requesting our review regarding federally listed species. |
| 04-09-97 | The Service sent a letter to NASA providing comments on the Environmental Assessment and indicated that the project, as proposed, may affect the piping plover. |

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- 04-22-97 The Service met with NASA, the Virginia Department of Game and Inland Fisheries (VDGIF), and the Virginia Commercial Space Flight Authority to discuss the proposed project. NASA provided the Service with a letter regarding their estimate of the piping plover habitat to be impacted by the proposed project.
- 04-22-97 The Service received NASA's request to initiate formal consultation.
- 05-06-97 The Service sent a letter to the Corps indicating that NASA had requested formal consultation and no Corps' permits should be issued for this project until formal consultation has been completed.

II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

NASA proposes to enhance national launch capabilities through improvements to infrastructure and expansion of launch range capabilities. The major actions include: (1) establishment of a commercial Spaceport, (2) improvements to infrastructure to support a commercial Spaceport, (3) expanding launch operations to accommodate twelve orbital launches per year, and (4) restoration of the historical level and nature of operations at Wallops Flight Facility. The only action that may affect the piping plover is the use of launch pad 0-B. Construction of launch pad 0-B is proposed and will be used in conjunction with the existing launch pad 0-A to launch no more than twelve orbital launches per year from Wallops Flight Facility in Accomack County, Virginia (Figure 1). NASA has stated that a minimum of 60 to 90 days is required to prepare for a single launch event at one of the two pads.

Pad 0-B will be 19,000 square feet with a 170 foot high service tower. Other equipment will also be attached to this pad to facilitate launch operations. This facility would support the launching of expendable launch vehicles capable of placing small-to-medium payloads into orbit. Vehicle and payload handling within the pad and service tower area will be accomplished by a 75-ton capacity bridge crane. The proposed construction site will impact 1,315 square meters (m) (approximately 1/3 acre) of wetlands. The entire island is located within the 100-year flood plain. As part of the project, NASA has agreed to monitor piping plovers. The monitoring plan is in Appendix A.

Damage to local biological resources resulting from launch activities can be anticipated within a 1,000 m radius of the launch pad. The principal impacts radiate approximately 200 to 300 m within the combustion path. Searing of vegetation and injury or death to fauna can occur within this zone. Interruption of faunal activities is expected within a 1,000 m radius of the launch pad for 2 to 10 minutes during launch operations. The combustion products and initial sound blast will be directed toward the Atlantic Ocean. Launches may be conducted during any time of the year and any time of the day or night.

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RANGEWIDE STATUS OF THE SPECIES

Life History

Piping plovers are small beige and white shorebirds with a black band across their breast and forehead. They typically feed on small invertebrates within intertidal surf zones, mud flats, tidal pool edges, barrier flats, and sand flats. The nesting season typically lasts from late April to late July. The nest is a shallow depression in the sand, typically lined with bits of broken seashells or fine pebbles. Incubation lasts for 26 to 30 days and is shared equally by both adults. The chicks leave the nest within hours of hatching and begin feeding on their own as soon as they can stand. Chicks are defended by the adults and can fly after 28 to 35 days. A more detailed and comprehensive description of the life history of the plover is provided in the recovery plan (U.S. Fish and Wildlife Service 1996).

Status of the Species Within its Range

Piping plovers occur in three disjunct populations in North America: Northern Great Plains, Great Lakes, and Atlantic Coast. The Atlantic Coast piping plover breeds on coastal beaches from Newfoundland to North Carolina (and occasionally South Carolina) and winters along the coast from North Carolina south, along the Gulf Coast and in the Caribbean (U.S. Fish and Wildlife Service 1996). The recovery plan divides the Atlantic Coast population into four recovery units: Atlantic Canada, New England, New York-New Jersey, and Southern (Delaware, Maryland, Virginia, and North Carolina).

Since 1986, the Atlantic Coast population has increased from 790 pairs to 1,347 pairs in 1996. However, most of the apparent increase between 1986 and 1989 is attributable to increased survey effort in two states. In addition, the population increase between 1989 and 1995 was very unevenly distributed. Between 1989 and 1995, the New England subpopulation increased by 346 pairs, while the New York-New Jersey and the Southern subpopulations gained 82 and 16 pairs, respectively, and the Atlantic Canada population decreased by 34 pairs. Substantially higher productivity rates have also been observed in New England than elsewhere in the Atlantic Coast population's range. In 1996, all recovery units either declined or increased less than expected based on 1995 productivity data. The Southern recovery unit declined 13% between 1995 and 1996. This is significant because the recovery plan ties recovery of the species to improved status of all four recovery units. The relative lack of recovery of the Southern subpopulation has heightened concern over any proposed activities which would further impede recovery in this area. Recovery of the Atlantic Coast piping plover population is occurring in the context of an extremely intensive protection effort now being implemented on an annual basis. Pressure on Atlantic Coast beach habitat from development and human disturbance is pervasive and unrelenting, and the species is sparsely distributed (U.S. Fish and Wildlife Service (1996).

In Virginia, piping plovers nest in Accomack and Northampton Counties on the barrier islands and on beaches in the Cities of Hampton and Portsmouth. Between 1989 and 1991, the number

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of piping plover pairs in Virginia increased from 100 to 131. In 1992, the number of nesting pairs was 97, and since then there have been serious population fluctuations. In 1996, only 87 pairs of plovers were documented. Annual productivity (numbers of chicks fledged/pair) has fluctuated widely, but was relatively high in 1996.

Threats to the Species

Loss and degradation of habitat due to development and shoreline stabilization have been major contributors to the species' decline. Disturbance by humans and pets often reduces the functional suitability of habitat and causes direct and indirect mortality of eggs and chicks. Predation has also been identified as a major factor limiting piping plover reproductive success at many Atlantic Coast sites. Substantial evidence shows that human activities are affecting types, numbers, and activity patterns of predators, thereby exacerbating natural predation (U.S. Fish and Wildlife Service 1996). A more detailed and comprehensive description of threats to the plover is provided in the recovery plan (U.S. Fish and Wildlife Service 1996).

Recovery Goals and Accomplishments

The Atlantic Coast population of the piping plover was listed as threatened in 1986. The primary recovery objective is to remove the Atlantic Coast plover population from the list of Endangered and Threatened Wildlife and Plants by achieving well-distributed increases in numbers and productivity of breeding pairs and providing for long-term protection of breeding and wintering plovers and their habitat. Delisting may be considered when the following criteria have been met: (1) increase and maintain for 5 years a total of 2,000 breeding pairs distributed among four recovery units as follows--Atlantic Canada, 400 pairs; New England 525 pairs; New York-New Jersey, 575 pairs; Southern, 400 pairs; (2) verify the adequacy of a 2,000-pair population to maintain heterozygosity and allelic diversity over the long-term; (3) achieve five-year average productivity of 1.5 fledged chicks per pair in each recovery unit, based on data from sites that collectively support at least 90% of the recovery unit's population; (4) institute long-term agreements to assure protection and management sufficient to maintain the population targets and average productivity in each recovery unit; and (5) ensure long-term maintenance of wintering habitat, sufficient in quantity, quality, and distribution to maintain survival rates for a 2,000-pair population. At the present time, these criteria are not close to being accomplished.

ENVIRONMENTAL BASELINE

As defined in 50 CFR 402.02 "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas. The "action area" is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The direct and indirect effects of the actions and activities resulting from the federal action must be considered in conjunction with the effects of other past and present federal, state, or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area.

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The Service has determined that the action area for this project is the portion of Wallops Island within 1,207 m (0.75 miles) south of launch pad 0-B.

Status of the Species in the Action Area - Piping plovers have nested at the north and south end of Wallops Island. The plover nesting area on the north end of the island is approximately 7 kilometers from the proposed project site. No impacts are expected to occur to the plovers at the north end of the island and only concerns related to plovers at the south end of the island will be addressed. Information about the plover at the southern end of the island is detailed below.

Wallops Island (Southern End) Piping Plover Data

| Year | # Pairs | # Young Fledged | Comments |
|------|---------|-----------------|---|
| 1986 | 2 | 0 | |
| 1987 | 2 | 3 | |
| 1988 | 0 | 0 | |
| 1989 | 5 | unknown | |
| 1990 | 5 | unknown | |
| 1991 | 3 | unknown | |
| 1992 | 4 | 5 | 1.25 young fledged/pair |
| 1993 | 3 | 4 | 1.33 young fledged/pair |
| 1994 | 3 | 2 | 0.67 young fledged/pair |
| 1995 | 2 | 4 | 2.00 young fledged/pair |
| 1996 | 1 | 0 | Initial nest and renesting attempt both lost to predation by red fox. |

Suitable plover nesting habitat at the southern end of the island was mapped and measured before and after the storms of 1991-1992. There was a 77% increase in the amount of nesting habitat available between years. Despite the increase in available habitat, there was no significant increase in numbers of nesting piping plovers, and their distribution throughout the available habitat remained similar to previous years, suggesting that birds were not available to colonize the newly created habitat (VDGIF 1992-1993). At the present time, the habitat at the southern end of Wallops is becoming less suitable due to encroaching vegetation (B. Cross, VDGIF, pers. comm. 1997; VDGIF 1995-1996).

The plover nesting and foraging area at the south end of the island is approximately 1,087 m from the proposed launch pad. Therefore, it is estimated that only the small portion (approximately

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400 square meters) of existing plover habitat within the action area will be affected by launches at pad 0-B.

Effects of the Action - No information is available on the effects of rocket launches on foraging and nesting shorebirds. The most similar action for which Service has such information relates to fireworks displays (U.S. Fish and Wildlife Service 1997). Direct impacts to plovers from fireworks early in the breeding season may cause plovers to abandon their territories. Plovers will often abandon their nests and broods during fireworks displays, exposing eggs and chicks to weather and predators. If a flightless chick were to become permanently separated from its parents during the confusion, mortality is almost certain. Abandonment of colonies as a result of fireworks has been documented in other colonial-nesting birds. For example, a fireworks display in New Jersey caused permanent abandonment of a least tern (*Sterna antillarum*) colony located more than 250 m away. In addition, temporary abandonment and displays of distress were documented in a least tern colony located greater than 0.75 miles from a fireworks event. The Service's guidance (U.S. Fish and Wildlife Service 1997) recommends that fireworks launch sites be located at least 0.75 miles from the nearest piping plover nesting and/or foraging area.

Direct impacts to the piping plover from the construction of the proposed rocket launch facility are not anticipated because of the distance (1,087 m) from launch pad to the nesting/foraging area. The piping plover may be adversely affected by the noise and light associated with rocket launches. NASA has estimated actual launch operations will last from 2 to 10 minutes. Because no data specific to this type of activity is available, it is difficult to anticipate how plovers will be affected. The Service anticipates that between March 1 and September 15 of any year, depending on the time of year, time of day, and proximity to the launch site, plovers will temporarily abandon the area during migration and/or the breeding season. While temporary abandonment of eggs or chicks does increase the chances of predation and exposure to the elements, actual mortality or reduced productivity is very unlikely. Similarly, a brief interruption in foraging will not result in significant impacts. The Service anticipates minimal impacts to the plover because of the short duration of the disturbance, the long distance between the disturbance and the area used by plovers, the limited number of launches during the nesting season, and the lack of other disturbances (e.g., recreation) to the plovers at this site.

Cumulative Effects - Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA. The Service is not aware of any cumulative effects.

CONCLUSION

After reviewing the current status of the piping plover throughout its range and in the action area, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that construction and use of launch pad 0-

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B, as proposed, is not likely to jeopardize the continued existence of the piping plover. No critical habitat has been designated for this species, therefore, none will be affected.

III. INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the federal agency or applicant. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

AMOUNT OR EXTENT OF TAKE

The Service does not anticipate the proposed action will incidentally take any piping plovers due to the short duration of the disturbance, the distance between the launch pad and the plover nesting/foraging area, the limited number of launches that are likely to occur during the nesting season, and the lack of other disturbances (e.g., recreation).

IV. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans and other recovery activities, or to develop information to benefit the species. The Service recommends that following be implemented by NASA:

- o Whenever possible, conduct launches during daylight hours.
- o Provide more substantial fencing at the perimeter of piping plover use areas at the north and south ends of island to prevent human intrusion.
- o Post the fenced areas with "sensitive wildlife area" signs.
- o Close the piping plover use areas from March 1 through September 15 of every year to discourage human intrusion.

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- o Piping plover nests should be protected with predator exclosures upon completion of the clutch.

In order for the Service to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, the Service requests notification of the implementation of any of these conservation recommendations by NASA.

V. REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the NASA request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If this opinion does not contain national security or confidential business information, the Service will provide copies to the appropriate state natural resource agencies ten business days after the date of this opinion.

The Service appreciates this opportunity to work with NASA and the Corps in fulfilling our mutual responsibilities under the ESA. Please contact Cindy Schulz of this office at (804) 693-6694, extension 127, if you require additional information.

Sincerely,



Karen L. Mayne
Supervisor
Virginia Field Office

Enclosures

LITERATURE CITED

- U.S. Fish and Wildlife Service. 1996. Piping plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, MA. 258pp.
- U.S. Fish and Wildlife Service. 1997. Guidelines for managing fireworks in the vicinity of piping plovers and seabeach amaranth on the U.S. Atlantic Coast. Unpublished Report. Hadley, MA. 5pp.
- Virginia Department of Game and Inland Fisheries. 1992-1993. Annual report nongame and endangered wildlife program. Richmond, VA.
- Virginia Department of Game and Inland Fisheries. 1995-1996. Annual report nongame and endangered wildlife program. Richmond, VA.

APPENDIX ANASA PIPING PLOVER MONITORING PLAN FOR ROCKET LAUNCHES FROM PAD 0-B
WALLOPS ISLAND, VIRGINIA

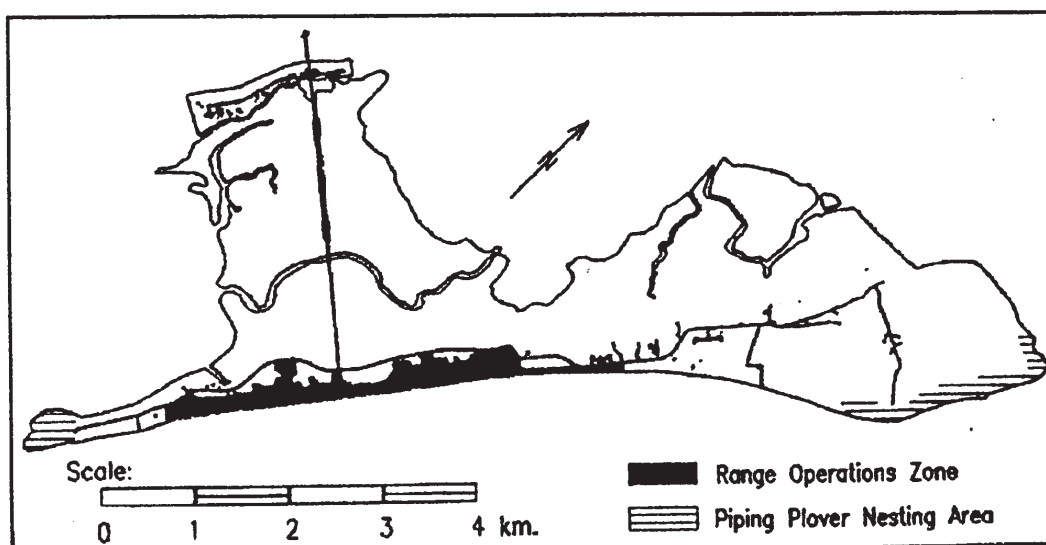
1. Monitoring of piping plovers at the south end of Wallops Island will occur during the first three launches from launch pad 0-B that take place between March 1 and September 15. Depending on the results of the surveys, additional years of monitoring may be required at the discretion of the Service. Monitoring will be conducted daily for 7 consecutive days prior to a launch, during the launch (as dictated by human safety considerations), and for 7 consecutive days after the day of the launch. If it is not possible to monitor during the launch, monitoring will occur immediately before and after the launch. Monitoring should occur twice daily, early in the morning and late in the evening. Each monitoring event should be no longer than one hour and should only be as long as is required to collect the data listed below. A delay of the launch date may require additional monitoring. Each monitoring event will include:
 - o A detailed, to scale, map indicating the location of plovers and their nests in relation to the launch pad.
 - o Counts and locations of chicks.
 - o Habitat description of the areas utilized by the plover and in immediate vicinity of each nest.
 - o Dates for laying of each egg, if observed.
 - o Dates for loss of any chicks.
 - o Indices of predator abundance (presence or absence at the nest, track counts, etc.).
 - o Documentation of any sources of additional disturbance.
 - o Eggs counts per nest.
 - o Behavior of individual plovers (e.g., foraging, brooding, leaving area). This will include determining the frequency of incubation and causes and duration of any interruption to incubation or chick foraging.
 - o If pre-fledged young are present, their movements (foraging area and distance and direction moved from nest) should be plotted throughout the monitoring period.
 - o Peck rates should be measured for pre-fledged young during five-minute observation periods conducted during each monitoring event. The number of observation periods sufficient for analysis should be determined by the observer.
 - o On each data sheet, the following information should be recorded: date, start/stop time of observations, observer's name, weather conditions (e.g., raining, sunny), and temperature.
 - o The above information should also be recorded for Wilson's plovers to increase the sample size.
2. A summary report along with copies of any field notes will be submitted to the Service, at the address provided below, within 10 days of the last day of monitoring for each launch event. Monitoring will be conducted by an individual approved by the Service and the

VDGIF. The name and qualifications of the individual must be provided to the Service at least 90 days before the first day of monitoring for the first launch event to be monitored.

3. Within 30 days of providing the Service with the monitoring report for the third launch taking place between March 1 and September 15, NASA will contact the Service to arrange a meeting to discuss the necessity, duration, and intensity of additional monitoring.
4. All information to be provided to the Service should be sent to:

Virginia Field Office
U.S. Fish and Wildlife Service
P.O. Box 99
6669 Short Lane
Gloucester, VA 23061
Phone (804) 693-6694
Fax (804) 693-9032

Figure 1. Location of the National Aeronautics and Space Administration's Proposed Launch Pad 0-B and Piping Plover Use Area on Wallops Island in Accomack County, Virginia.



Appendix H

Projected Noise Impact Area



Appendix I

Grammatical Corrections and Technical Clarifications

Grammatical Corrections

Examples of these changes are listed below:

- Use metric units of measure with British system units in parentheses.
- “will”s to “would”s
- “significant”s to “substantial”s
- A Glossary of Technical Terms has been added
- “Cape Canaveral Air Force Station” changed to “Cape Canaveral Air Station”
- Changing capitalization of text
- Updating citations
- Quantifying probabilities

Abstract

Page v: Major action (3) in the first paragraph

Original Text: expanding launch operations to accommodate twelve orbital launches per year.

Updated Text: expanding launch operations to accommodate twelve additional orbital launches per year.

Purpose and Need

Page 1-2: Second paragraph, third sentence to end has been modified for clarification.

Original Text: The proposed annual launch schedule for WFF is anticipated to increase by twelve payloads delivered to low or medium earth orbits. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 (LMLV-3) is the largest vehicle expected to be launched from WFF. The configuration of this vehicle is presented in Section 2.1.3. Smaller vehicles would be used where appropriate.

Updated Text: The proposed annual launch schedule for WFF is anticipated to increase by twelve payloads delivered to low or medium earth orbits. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 (LMLV-3) is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, the LMLV-3 has been selected as a demonstration vehicle to evaluate environmental impacts. The configuration of this vehicle is presented in Section 2.1.3. Smaller

vehicles would be used where appropriate.

Description of Proposed Action and Alternatives

Page 2-2: Major action (3) in the first paragraph:

Original Text: expanding operations at WFF to accommodate twelve orbital launches per year.

Updated Text: expanding operations at WFF to accommodate twelve additional orbital launches per year¹.

Page 2-3: First sentence in the fifth full paragraph:

Original Text: The purpose of the expansion of launch range operations is to conduct up to 12 orbital launches per year, in addition to the historical level of launches conducted at WFF.

Updated Text: The purpose of the expansion of launch range operations is to conduct twelve additional orbital launches per year¹, in addition to the historical level of launches conducted at WFF.

Pages 2-3: Last sentence in the fifth full paragraph:

Original Text: Any combination of vehicles or activities with impacts less than or equal to twelve LMLV-3(8) launches per calendar year is within the scope of this EA.

Updated Text: Any combination of twelve additional orbital launches¹ with acute or cumulative impacts less than or equal to twelve LMLV-3(8) launches per calendar year is within the scope of this EA.

Page 2-8: The last sentence in the fourth full paragraph:

Original Text: Any combination of vehicles or activities with emissions and impacts less than or equal to twelve LMLV-3 launches per calendar year are within the scope of this EA.

Updated Text: Any combination of twelve additional orbital launches¹ with emissions and impacts less than or equal to twelve LMLV-3(8) launches per calendar year is within the scope of this EA.

1. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, this vehicle has been selected as a demonstration vehicle to evaluate environmental impacts.

Page 2-8: Second text box

Original Text: Addressed by this EA are any combination of vehicles or activities with less than or equal to the acute and/or chronic environmental impact of twelve LMLV-3 launches per calendar year.

Updated Text: Addressed by this EA are any combination of twelve additional orbital launches¹ with less than or equal to the acute and/or chronic environmental impact of twelve LMLV-3(8) launches per calendar year.

Page 2-10: First full paragraph, seventh sentence to end:

Original Text: Figure 2-7 “Average Number of Sounding Rocket Launches from WFF per Year” on page 2-10 depicts, from a historical perspective, the average number of launches per year from WFF.

Updated Text: Figure 2-7 “Average Number of NASA Sounding Rocket Launches from WFF per Year” on page 2-10 depicts, from a historical perspective, the average number of sounding rockets launched by NASA per year from WFF. However, aggregate suborbital activity at WFF from NASA, Navy, and other governmental programs and projects has been substantially greater (approximately 70 launches per year).

Page 2-11: Second full paragraph, last sentence:

Text has been changed from “satellite vehicles” to “orbital spacecraft”.

Page 2-11: Last two sentences of the last paragraph

Original Text: Construction of a new causeway bridge elsewhere, or a new transportation route to the island would trigger additional National Environmental Policy Act (NEPA) review processes. The replacement in kind or upgrades to the existing structure considered in this document could be addressed with a NASA categorical exclusion.

Updated Text: Modification of the existing causeway bridge, construction of a new bridge elsewhere, or a new transportation route to the island would require additional National Environmental Policy Act (NEPA) review.

Page 2-12: Second sentence under 2.1.5.2 has been modified for clarification.

Original Text: This eliminates the need to install any additional type of permanent stor-

1. Several launch vehicles could be used to support these launches, but the Lockheed-Martin Launch Vehicle-3 is the largest vehicle expected to be launched from WFF in terms of solid propellant weight for the first stage (approximately 133,120 kg (293,479 lb)). Therefore, this vehicle has been selected as a demonstration vehicle to evaluate environmental impacts.

age, distribution or fueling system on the island for liquid fueled rockets.

Updated Text: Presently the need to install any additional type of permanent storage, distribution or fueling system on the island for liquid fueled rockets is not anticipated.

Page 2-13: First sentence of Section 2.2

Original Text: Spaceport Florida is the only other U.S. commercial launch site capable of the orbital inclinations accessible from WFF.

Updated Text: Presently, Spaceport Florida is the only other U.S. commercial launch site offering comparable economics for orbital inclinations accessible from WFF.

Page 2-13: The following statements has been added to the end of paragraphs 2 and 3 in Section 2.2 respectively:

Paragraph 2: Thus, these launch sites are not considered reasonable alternatives to the proposed action.

Paragraph 3: Thus, foreign launch sites are not considered reasonable alternatives to the proposed action.

Page 2-14: The following text has been added to the end of Section 2.2.

In addition, WFF is located near the 38th parallel. This latitudinal position offers a technological advantage (over the other alternatives), for reaching equatorial orbit inclinations of 38°-65°. WFF would be the most cost-efficient launch site within the U.S. for delivering low and medium earth orbital payloads requiring these trajectories. The WFF launch range is a uniquely positioned national asset that would be an optimal launch site for unmanned replenishments for the proposed International Space Station slated to orbit the earth at 40°.

Existing Environment

Page 3-2: The following text has been added to the end of the first paragraph in section 3.2.

A baseline noise survey for the surrounding area is presented in the ERD. Monitoring periods ranged from 15 minutes to 1 hour. Monitoring conducted along Route 803 at the Assawoman Post Office suggest that baseline noise level is between 59 and 64 dBA L_{eq} . Direct sound level measurements in Atlantic, Virginia along Route 803 were taken in September 1996, in conjunction with range activities on Wallops Island. The direct sound levels associated with road noise, measured between 11:00 a.m. and 12:00 p.m., were 124 and 121 dBA.

L_{eq} - Time average sound energy level

Page 3-2: The following text has been added as the last sentence to paragraph 3 in Section 3.2

A noise contour map is located in Appendix H.

Page 3-3: The following sentence will be added to Section 3.3.1., the last sentence to the first paragraph.

Virginia's standards pertaining to surface water are located in the Virginia Administrative Code 9VAC25-260-140. Additionally, Virginia's standards pertaining to dissolved oxygen, pH, and maximum temperature are located in 9VAC25-260-50.

Page 3-6: Pollution Prevention has been added to the heading in Section 3.8

Page 3-7: Section 3.8.3 has been added to Section 3.8

In accordance with Executive Order 12856, WFF has an approved Pollution Prevention Program Plan. The WFF plan is based on proactive management of pollution. Pollution prevention provides methods for reducing wastes at the source, and therefore reduces the overall volume for storage and disposal. WFF's goals for pollution prevention are achieved through the implementation of inventory control, material substitution, recycling, process efficiency improvements, preventive maintenance, and improved housekeeping.

Page 3-11: The following text has been added to the end of the first paragraph in section 3.12.1:

Wetlands are delineated in Figure 2-5 on page 2-7 for the proposed expansion area.

Page 3-11: The following text has been added to the end of the second paragraph in section 3.12.2:

Wetlands are delineated in Figure 2-5 on page 2-7 for the proposed expansion area.

Environmental Consequences

Page 4-6: The following text has been added after the sixth sentence in paragraph 2 in Section 4.1.2

A noise contour map is located in Appendix H.

Page 4-6: The following text has been added as the last sentence in paragraph 2 in Section 4.1.2

The public will be notified in advance of launch dates.

Page 4-7: The following text has been added to the end of section 4.1.3.2.

Surface water in the vicinity of launch complex 0 will be monitored for pH. Water quality standards for pH of Class I (Open Ocean) and Class II (Estuarine) waters are provided in the Virginia Administrative Code 9VAC25-260-50 along with dissolved oxygen and temperature regulatory limits. These standards are presented below in Table 4-4: “Table 4-4: Virginia Standards for Dissolved Oxygen, pH, and Maximum Temperature”.

Table 4-4: Virginia Standards for Dissolved Oxygen, pH, and Maximum Temperature

| DESCRIPTION Class of Waters | DISSOLVED OXYGEN (mg/L) | | pH | TEMPERATURE |
|------------------------------------|-------------------------|---------------|----------------|--------------|
| | Minimum | Daily Average | Range | Maximum (°C) |
| I Open Ocean | 5.0 | NA | 6.0-9.0 | NA |
| II Estuarine Waters | 4.0 | 5.0 | 6.0-9.0 | NA |

NA: Not Applicable

Page 4-11: Results of the Section 7 Consultation: The following text has replaced paragraph 2 in section 4.1.5

A formal section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) was conducted for the piping plover. It is the USFWS’s biological opinion that WFF’s proposed action is not likely to jeopardize the continued existence of the piping plover on Wallops Island. To ensure the well being of this species, the USFWS has prepared a monitoring plan for the first three launches from pad 0-B to occur during the piping plover nesting season. More detail on this plan is provided in section 5 of the EA, and the consultation is presented as Appendix G.

Page 4-12: The following text has been added to section 4.1.6.1:

(1) A bullet for “Explosive Safety” has been added to the list of areas addressed in the Ground Safety Plan; and (2) Text added between the first and second sentence of paragraph 2. To ensure the safety of personnel, property, and the public, the use of quantity distances and other protective engineering controls would continue when dealing with explosives and/or other hazardous materials.

Page 4-12: Second and third sentences of fourth paragraph have been combined and modified for clarification.

Original Text: Cryogenic storage tanks for liquid fuels will not be added to the infrastructure of WFF. Liquid fuels will be transported by tanker for direct loading into the launch vehicle.

Updated Text: Based on current infrastructure configuration, liquid fuels would be transported by tanker for direct loading into the launch vehicle.

Page 4-13: The following text has been added to the end of section 4.1.6.2

Flight termination boundaries are designed to ensure that vehicle destruction occurs within a predetermined safety zone. This safety zone is established for the protection of the public, personnel, and the environment. In addition, while failures have occurred in the past, the 46 year history of WFF offers no evidence of acute or cumulative environmental impacts as a result of launch failures.

Page 4-14: The following text has been added to the end of section 4.1.7

Potential toxic corridors are defined in mission-specific Operations and Safety Directives. These hazard zones are designed to protect personnel, environment, and the public.

Page 4-14: Pollution Prevention has been added to the heading in Section 4.1.8

Page 4-14: The following text has been added to the end of paragraph two in Section 4.1.8

In addition, WFF would continue to monitor existing and proposed activities and programs to ensure compliance with the pollution prevention program objectives.

Page 4-15: Section 4.1.9 paragraph 4, has been modified:

Original Text: Currently, WFF has no known resources listed on the National Register of Historic Places (Reference 18).

Updated Text: Currently, WFF has no known resources listed or eligible for listing on the National Register of Historic Places (Reference 18).

Page 4-15: Section 4.1.9 paragraph 4, has been modified:

Original Text: There are no archaeological sites or historic structures present in the immediate area of the proposed launch pad.

Updated Text: According to VCSFA's consultation with the Department of Historic Resources, there are no archaeological sites or historic structures present in the immediate area of the proposed launch pad.

Page 4-15: The following text has been added to the end of the fourth paragraph in Section 4.1.9:

The proposed action will not affect any property listed or eligible for listing on the National Register of Historic Places.

Page 4-16: Section 4.1.11 paragraph 2, has been modified:

Original Text: A review process will be established to minimize potential negative impacts from land development. This review process will require the completion of a preliminary environmental survey by the proponent. The survey will be reviewed by the WFF environmental office, regarding activities conducted within the Range Operations Zone prior to the commencement of any improvements (See Appendix A).

Updated Text: A review process has been established to minimize potential negative impacts from land development.. This review process requires the completion of a preliminary environmental survey by the proponent. The survey is reviewed by the WFF environmental office, regarding activities conducted within the Range Operations Zone prior to the commencement of any improvements (See Appendix A).

Page 4-16: The third paragraph in Section 4.1.11 will begin with “Future improvements...”

Page 4-17: The last sentence of the third paragraph in section 4.1.12 has been modified:

Original Text: Therefore, no practicable alternative exists for the proposed location of Pad 0-B.

Updated Text: Therefore, no practicable alternative exists for the proposed location of Pad 0-B, which would partly (1280 m2 (1/3 acre)) be located in a wetland. Wetlands are delineated in Figure 2-5 on page 2-7 for the proposed expansion area.

Page 4-18: Section 4.1.12 paragraph 5 has been modified.

Original Text: Applicable permits and approvals listed under the Enforceable Programs of the VCRMP must be obtained by VSC prior to initiating any construction associated with the commercial Spaceport.

New Text: The Commonwealth of Virginia has made the determination that the proposed action is consistent with the VCRMP. However, this decision stipulates that applicable permits and approvals listed under the Enforceable Programs of the VCRMP would be obtained by VSC prior to initiating any construction associated with the commercial Spaceport.

Mitigation and Monitoring

Page 5-1: The following text has been added to the end of Section 5.1:

The public will be informed beforehand on the planned dates for launches.

Page 5-2: Second sentence of the fourth paragraph in section 5.2 has been modified for clarification.

Original Text:: Cryogenic storage tanks for liquid fuels will not be added to the infrastructure of WFF, reducing the probability for leaks or spills which could be associated with expanding launch range operations.

Updated Text: Based on current infrastructure configuration, liquid fuels would be transported by tanker for direct loading into the launch vehicle, reducing probability for leaks or spills which could be associated with cryogenic storage tanks.

Page 5-2: The following text has been added to the end of Section 5.2:

The pH of surface water in the vicinity of launch complex 0 may be slightly decreased for brief periods after launch as discussed in Section 4.1.3.2. Therefore, estuarine surface water in the vicinity of launch complex 0 will be monitored to detect and quantify any deviations in pH. The data will be compared to the Virginia water quality standards listed in Section 4.1.3.2 and used to facilitate any future decisions regarding mitigation or regulatory control of stormwater associated with launch complex 0.

Page 5-2: Section 5.3 paragraph 2, the following has replaced text from the third sentence to the end of the paragraph.

Original Text: WFF will monitor the piping plovers during the first three launches from pad 0-B that take place between March 1 and September 15. Observation of this species will take place prior to the launch. A summary report will be submitted to the USFWS within 10 days of the last monitoring event. Thus far, activities on the island have not affected the piping plover breeding grounds.

Updated Text: The USFWS has prepared a monitoring plan for the piping plover as part of the formal section 7 consultation. Monitoring of the piping plovers at the south end of Wallops Island will occur during the first three launches from pad 0-B that take place between March 1, and September 15. In accordance with this monitoring plan, observation of the piping plovers will take place for 7 consecutive days prior to the launch, during (as dictated by human safety considerations), and for 7 consecutive days after the launch. A summary report will be submitted to the USFWS within ten days of the last day of monitoring for each event. Depending on the results of the surveys, additional monitoring may be required at the discretion of the USFWS. Thus far, activities on the island have not affected the piping plover breeding grounds.

Agencies and Individuals Consulted

Page 6-1: NASA Personnel have been removed from the list of Agencies and Individuals Consulted. Coordination with State and Federal Regulatory Agencies has been added.

Appendix J

Responses to Comments

Lyman C. Welch
190 South La Salle Street
Chicago, Illinois 60603-3441

(312) 701-7404

September 25, 1997

Mr. Keith Koehler
Public Affairs Office
NASA Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337

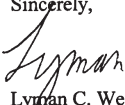
Re: Comments on Draft EA for launch expansion

Dear Mr. Koehler:

I am writing in support of NASA's decision to establish a FAA licensed commercial launch site and expand operations at the Wallops flight facility. The country is in great need of a regularly operating commercial launch facility with orbital launch capability.

The draft EA, however, only considers expansion to accommodate twelve orbital launches per year. Commercial demand for orbital launch capability is increasing rapidly and the improvements now being made to Wallops are of such a nature that the facility should be capable of accommodating orbital launches of a much greater frequency. Commercial demand combined with government needs may, in the near future, require significantly greater orbital launch capability (perhaps 26 orbital launches per year in the near future and as frequent as once a week from Wallops by early next century).

I urge you to incorporate into the draft EA the potential for increased orbital launches beyond the twelve per year now proposed. While such an increase would pose a slight additional increase in operational impacts, the value of the increased orbital launch capability may outweigh such concerns. Operations at Wallops should not be limited by a failure to consider the likely possibility of increased orbital launches in the facility's future operations.

Sincerely,

Lyman C. Welch

42201852.1

Commentor: Lyman C. Welsh
Chicago, Illinois

Comment noted. Thank you.

